Summary of Recent Guidelines on Hypertension

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3.1 Introduction

About 20–35% of the worldwide adult population has hypertension. It is the commonest noncommunicable disease and contributes to target organ damage in the heart, kidneys, and brain. Therefore, hypertension is a major contributor to cardiovascular disease (CVD) morbidity and mortality worldwide and in India. Taking into account the special geographical and climatic background, dietary habits, literacy levels and socioeconomic variables, there are significant regional variations in the manifestation and management of hypertension in different regions.

Substantial progress has been made in understanding the epidemiology, pathophysiology, and risk associated with hypertension, and there is a wealth of evidence showing that lowering blood pressure (BP) can substantially reduce premature morbidity and mortality. A number of proven, highly effective, and well-tolerated lifestyle and drug treatment strategies can facilitate this reduction in BP. Despite this, BP control rates remain abysmal worldwide. Therefore, hypertension remains the major preventable cause of CVD and all-cause death globally and in Asia.

Hypertension is a lifelong condition and therefore often requires long-term pharmacological treatment. Good hypertension management program is important if we want to reduce the overall impact of noncommunicable disease. However, economic factors have a significant impact on hypertension management protocols and feasibility. A comparison of some of these important economic and healthcare delivery system factors is shown in Table 3.1.

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Table 3.1 Differences in economic and healthcare delivery system factors between India, the US, and Europe

Parameters	USA	European Union	India
Population (2017) (million)	325.7	512.4	1339.1
GDP (2017) (trillion USD)	19.3	17.2	2.5
Per capita income (USD)	59,531	33,715	1939
Health expenditure (% of GDP)	16.8	7.9	3.9
Health expenditure per capita (USD)	9536	2192	63

GDP gross domestic product, *USD* United States dollar

Recently, various societies have published guidelines on management of hypertension: the American College of Cardiology/American Hypertension Association (ACC/AHA) in 2017 [1], the European Society of Cardiology/European Society of Hypertension (ESC/ESH) in 2018 [2], Indian Guidelines on Hypertension (IGH) IV in 2019 [3], the International Society of Hypertension in 2020 [4], and Canadian guidelines 2020 [5]. These have made some significant changes, including a change in definition of hypertension, changes in the target BP (based on the findings of the Systolic Blood Pressure Intervention Trial [SPRINT]), greater use of home blood pressure monitoring (HBPM) and ambulatory blood pressure monitoring (ABPM), reduced interest in renal angioplasty and renal denervation therapy due to recent data, and increased use of mineralocorticoid receptor antagonists (e.g., spironolactone) for resistant hypertension. In addition, there is new epidemiological data from different regions on hypertension and hypertension-mediated organ damage (HMOD).

This article provides a summary of the salient features of several current hypertension guidelines to help practicing physicians to streamline management of this important public health problem [6–9].

3.2 Definition and Classification

All currently used definitions of hypertension are arbitrary. There is some evidence that the risk of cardiovascular events in Asian Indians is higher at relatively lower levels of BP [10]. There is a continuous relationship between BP level and the risk of complications. Hazard ratio values for coronary heart disease (CHD) and stroke were 1.1–1.5 for a systolic BP (SBP)/diastolic BP (DBP) of 120–129/80–84 mmHg compared with <120/80 mmHg, and 1.5–2.0 for SBP/DBP 130–139/85–89 mmHg versus <120/80 mmHg [1].

The BP cutoff values used to define hypertension, has been a topic of intense debate over the last few years. Major guidelines recommend that hypertension is diagnosed when a person's office SBP is ≥140 mmHg and/or their DBP is ≥90 mmHg, or any BP level in patients taking antihypertensive medication (Table 3.2). Corresponding home and ambulatory BP values have also been defined (Table 3.3). The latest ACC/AHA guidelines changed the BP threshold for defining hypertension to ≥130/80 mmHg (Table 3.4). However, Indian [3], European [2], and ISH [4] guidelines, and many others, maintain the earlier definition of 140/90 mmHg. The lower BP cutoff value for defining hypertension in the ACC/AHA guideline was associated with an increase in prevalence of hypertension from

30 to 42% [6]. Definitions for each stage of hypertension also differ between the US and European guidelines (Table 3.5). Staging cutoff values in the IGH IV and ISH guidelines are similar to those in the ESC/ESH guidelines. However, all these guidelines do not differ markedly in terms of the target BP to be achieved.

Table 3.2 Classification of BP for adults aged ≥18 years (IGH IV [3] and ESC/ESH [2])

Category	Systolic (mmHg)		Diastolic (mmHg)
Optimal	<120	and	<80
Normal	<130	and	<85
High normal	130–139	or	85–89
Hypertension			
Stage 1	140–159	or	90–99
Stage 2	160–179	or	100–109
Stage 3	≥180	or	>110
Isolated systolic hypertension			
Grade 1	140–159	and	<90
Grade 2	>160	and	<90

Table 3.3 Diagnosis of hypertension based on office, home, and ambulatory BP values (ESC/ESH 2018 [2], IGH IV [3], and ISH 2020 [4])

	SBP (mmHg)	DBP (mmHg)
Office BP	≥140	≥90
Mean home BP	≥135	≥85
Ambulatory BP		
Mean daytime	≥135	≥85
Mean night-time	≥120	≥70
Mean 24-h	≥130	≥80

Table 3.4 Classification of BP in adults (ACC/AHA 2017) [1]

BP category	SBP (mmHg)		DBP (mmHg)
Normal	<120	and	<80
Elevated	120–129	and	<80
Hypertension			
Stage 1	130–139	or	80–89
Stage 2	≥140	or	≥90

Table 3.5 Comparison of ACC/AHA [1] and ESC/ESH [2] hypertension guidelines regarding definition and grading/staging of hypertension

Parameter	ACC/AHA	ESC/ESH
Definition (mmHg)	>130/80	>140/90
Grading of normal pressure (mmHg)	Normal: <120/80 Elevated: 120–129/<80	Optimal: <120/80 Normal: 120–129/80–84 High normal: 130–139/85–89
Grading of hypertension (mmHg)	Grade 1: 130–139/80–89 Grade 2: ≥140/90	Grade 1: 140–159/90–99 Grade 2: 160–179/100–109 Grade 3: ≥180/110
Target BP	≤65 years: <130/80 ≥ 65 years: <130/80	<65 years: <130/80 ≥65 years: <140/80

3.3 Measurement of Blood Pressure

BP can naturally vary widely over different time periods and the diagnosis of high BP should not be made on a single office measurement. Usually, 2–3 office readings taken at 1- to 4-week intervals (depending on the BP) should be taken to confirm the diagnosis of hypertension. The exception would be if BP is ≥180/110 mmHg or there is evidence of HMOD. Recommended methods for BP recording are similar in all the guidelines [1–5]. One important feature of more recent guidelines, including those from Asia, is the greater emphasis on out-of-office BP monitoring [11, 12]. The latest Canadian guidelines include HBPM as a part of the criteria to diagnose hypertension. Most other guidelines suggest that HBPM is used for diagnosis and follow up [1–4].

3.4 Epidemiology

The prevalence of hypertension is variable in different parts of the world. India and China are the two most populated countries, and between them they include 42% of the world's population. However, there are significant differences in the pattern and prevalence of hypertension between different Asian countries [10]. As a complication of hypertension, stroke is more common in China and Korea while South Asians have a higher prevalence of CVD [10]. However, some features are common to patients with hypertension across Asia (Box 3.1) [10].

In addition to the differences from other continents in Asia, there are also significant differences in the epidemiology of hypertension within various Asian countries. For example, in India there are rural versus urban differences in prevalence of hypertension [3]. Also, the prevalence of hypertension has increased over the last two to three decades in some developing countries [13]. The level of control of BP also varies between regions. In some developed countries such as the USA, BP control has been achieved in 50% of individuals [1]. However, in India, the BP control rate is only 20% in urban areas and 10% in rural areas [3]. The need for public awareness and better compliance is one of the reasons behind the development of country-specific guidelines.

Box 3.1: Features of Hypertension in Asians

- Masked hypertension is more common
- BP variability is more common
- Early morning surge and nocturnal rise are more common
- Region-wide differences in prevalence
- HBPM practices are variable
- Higher BP at lower BMI than in Europe

Table 3.6 Multiplication factors for calculating cardiovascular disease risk in immigrants according to the ESC/ESH guidelines [2]

Region of origin	Multiplication factor
Southern Asia	1.4
Sub-Saharan Africa	1.3
Caribbean	1.3
Western Asia	1.2
Northern Africa	0.9
Eastern Asia	0.7
Southern America	0.7

3.5 Hypertension and CVD Risk

Hypertension often coexists with other CVD risk factors such as metabolic syndrome, diabetes mellitus and dyslipidemia. This multiplies CVD risk, meaning that risk stratification is an important part of hypertension management.

Consideration of CVD risk has been suggested in nearly all current guidelines [1–4]. The ESC/ESH 2018 guidelines use the Systemic Coronary Risk Evaluation System (SCORE) for CVD risk, while the ACC/AHA guidelines use atherosclerotic CVD (ASCVD) risk for assessment of an individual's overall risk. Most scoring systems include five major risk factors including age, sex, dyslipidemia, diabetes mellitus and smoking. Risk modifiers that increase CVD risk estimation by the SCORE system of the ESC/ESH guidelines include obesity, physical inactivity, psychosocial stress, family history of premature CVD, autoimmune and inflammatory disorders, major psychiatric disorders, human immunodeficiency virus infection, atrial fibrillation, left ventricular (LV) hypertrophy, chronic kidney disease, obstructive sleep apnea and social deprivation. South Asians, especially Indians, are genetically at higher risk for CVD events. A multiple of 1.4 is recommended for calculating CVD risk in South Asians [2] (Table 3.6).

In addition to CVD risk factors, the presence of HMOD and associated clinical conditions (ACC) reduce the threshold for initiating pharmacotherapy. The prognosis of the patient, the urgency to initiate therapy, and BP targets during therapy should be based on the overall risk stratification depending on risk factors, HMOD and ACC.

3.6 Nonpharmacological Therapy

The primary goal of therapy is to effectively control BP to prevent, delay, or reverse the complications of hypertension and thus reduce overall CVD risk. Nonpharmacological approaches and lifestyle modifications are usually lifelong. Dietary patterns and other lifestyle factors vary significantly by region (Fig. 3.1). For example, salt intake is high in some regions of Asia, including India and China. Different guidelines have advocated salt restriction to a variable extent due to the prevalent pattern of diet [1, 4] (Table 3.7). Even the ESC/ESH guidelines suggest restriction of salt to less than 5 g/day [2]. Most guidelines recommend the DASH

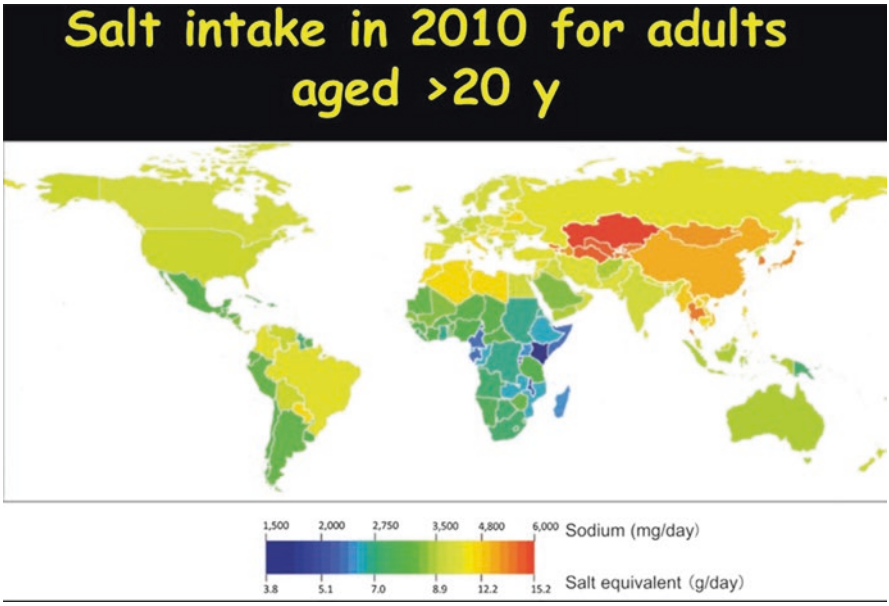

Fig. 3.1 Salt intake in different regions of the world [10]

Table 3.7 Daily salt intake recommended in different guidelines

	ACC/AHA guidelines	IGH–IV guidelines
Year	2017	2019
Daily salt intake recommended	3.75 g/day	6 g/day

diet (IGH IV [3] and ACC/AHA [1]). Potassium supplementation has also been recommendation in some guidelines (ACC/AHA) [1] but is less emphasized in others (ESC/ESH) [2]. Alcohol restriction is important and is equally recommended by all guidelines [14–16].

3.7 Threshold and Target of Drug Therapy

After assessing the patient and performing individualized risk stratification, the next step is to implement lifestyle modifications, then drug therapy can be considered. The threshold for starting drug therapy is somewhat lower in the ACC/AHA [1] guidelines than in the ESC/ESH [2] and IGH IV [3] guidelines due to the different definitions in these guidelines. However, the BP goal during treatment is same in all these guidelines (Fig. 3.2). The targets in the latest version of the ESC/ESH guidelines (2018) [2] are different to those in the earlier (2013) version (ESC 2013) [17] based on the availability of new data to support these recommendations (Fig. 3.3).

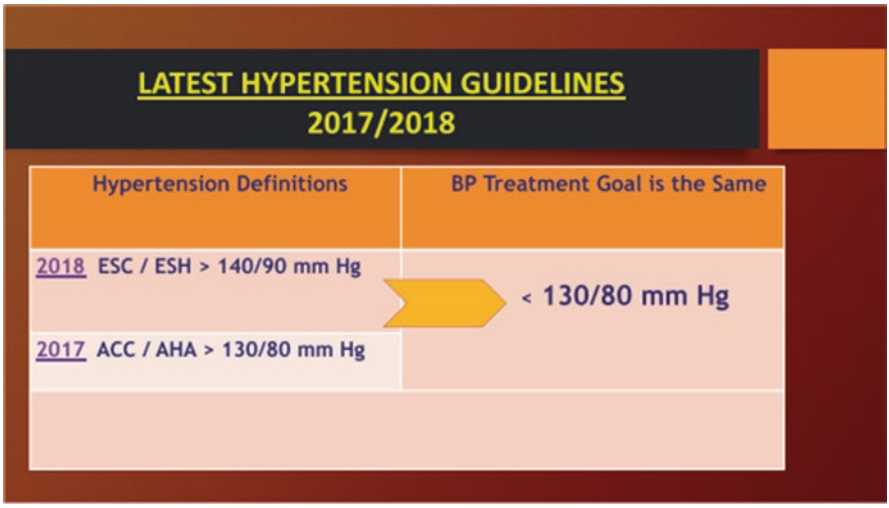

Fig. 3.2 Differences in definition and goal of treatment in the ESC/ESH and ACC/AHA guidelines [8]

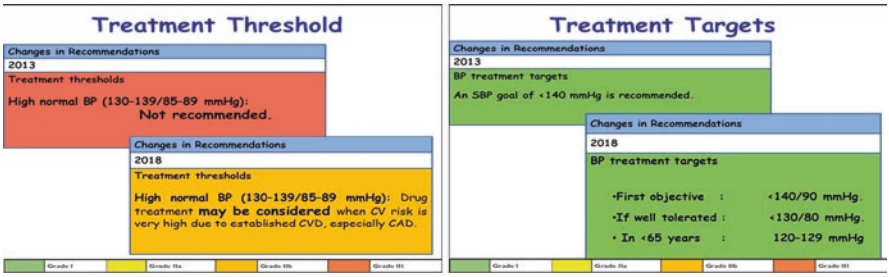

Fig. 3.3 Changes in treatment thresholds and targets between the 2013 and 2018 ESC/ESH guidelines

This change in the threshold and target is similar in other guidelines also [3, 4]. Thus, although the guidelines differ in their definition of hypertension, the approach to treatment is quite similar.

The ACC/AHA guidelines provide the same target of 130/80 mm Hg for all patients with hypertension, irrespective of age and comorbidities [1]. A significant addition in the ESC/ESH guidelines is the recommendation relating to the target DBP level, which should not be below 70 mmHg (Table 3.8) [2]. The table also shows the range in which systolic and diastolic blood pressure should be kept. This is different from the ACC/AHA guidelines, which only give a single BP value [1]. The Indian guidelines (IGH IV) provide a range of SBP and DBP values for different individuals depending on age and comorbidities (Table 3.9) [3].

Table 3.8 The desirable range of diastolic blood pressure in the ESC/ESH guidelines [2]

Age group	Office SBP treatment target ranges (mmHg)					DBP target range (mmHg)
	Hypertension	+ Diabetes	+ CKD	+ CAD	+ Stroke/ TIA	
18–65 years	Target to 130 *or lower if tolerated* Not <120	Target to 130 *or lower if tolerated* Not <120	Target to <140–130 *if tolerated*	Target to 130 *or lower if tolerated* Not <120	Target to 130 *or lower if tolerated* Not <120	<80–70
65–79 years	Target to <140–130 *if tolerated*	Target to <140–130 *if tolerated*	Target to <140–130 *if tolerated*	Target to <140–130 *if tolerated*	Target to <140–130 *if tolerated*	<80–70
≥80 years	Target to <140–130 *if tolerated*	Target to <140–130 *if tolerated*	Target to <140–130 *if tolerated*	Target to <140–130 *if tolerated*	Target to <140–130 *if tolerated*	<80–70
DBP target range	<80–70	<80–70	<80–70	<80–70	<80–70	

CKD chronic kidney disease, *TIA* transient ischemic attack

Table 3.9 BP thresholds for treatment initiation and target BP according to the IGH IV 2019 guidelines [3]

Subjects	Threshold to start treatment (≥), mmHg	Target BP range, mmHg
Age < 65 years		
High ASCVD risk	140/90	120–130/70–80
Low ASCVD risk	140/90	130–140/70–80
Age 65–80 years	140/90	130–140/70–80
Age > 80 years	140–150/90	130–140/70–80
With other risk factors		
Diabetes	140/90	130–140/70–80
History of stroke, TIA	140/90	130–140/70–80
Chronic kidney disease	140/90	130–140/70–80
Coronary artery disease	130/80	120–130/70–80
Heart failure	130/80	120–130/70–80

3.8 Pharmacotherapy

Four classes of antihypertensive agents are recommended by the ACC/AHA guidelines for the first-line treatment of hypertension [1]. These are angiotensin-converting enzyme inhibitors (ACEIs), angiotensin receptor blockers (ARBs), calcium channel blockers (CCBs), and diuretics. Beta-blockers are not recommended as first-line therapy by the ACC/AHA guidelines [1]. However, the ESC/ESH, IGH IV and ISH 2020 guidelines recommend that beta-blockers can be used as first-line agents in special situations, such as young individuals and those with angina, heart failure and after myocardial infarction [2–4]. Specific agents are mentioned within each guideline based on the local availability of specific agents within each class [18–20].

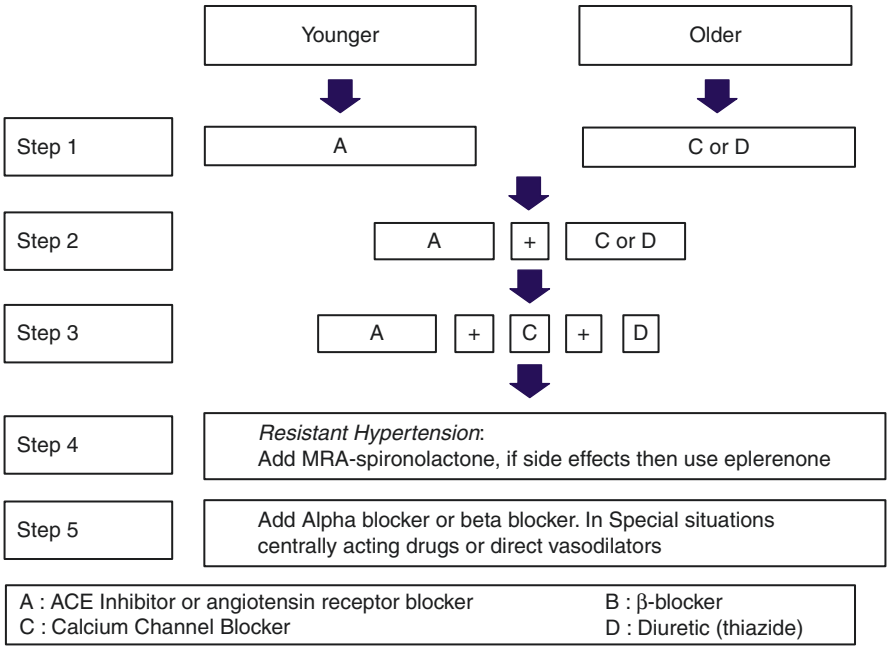

Fig. 3.4 Algorithm for approach to antihypertensive drug therapy in the IGH IV guidelines [3]

Most guidelines recommend the use of ARBs or ACEIs as first-line therapy in individuals aged <55–60 years [2, 3]. In elderly patients, CCBs and diuretics are recommended as first-line antihypertensive therapy [2, 3]. The IGH IV guidelines provide an algorithm for starting therapy and progressing to combination therapy for different individuals (Fig. 3.4).

Combination therapy is emphasized in all the recent guidelines [1–4]. The ESC/ESH guidelines recommend the use of a single pill combination (SPC) to improve compliance with therapy [2]. The ACC/AHA guidelines recommend specific combinations that are approved in that country [1]. Some guidelines even recommend triple combination SPCs because these are available in many countries.

3.9 Conclusion

The first guidelines on hypertension, were the JNC guidelines which were followed across the globe. However, after the JNC stopped issuing guidelines the ACC/AHA guidelines are followed in America. Various medical bodies have issued guidelines which have more relevance to the people of that country. There are some differences

in the definition and management approach of various guidelines. However, since they are all based on the recent evidence, they are similar on most issues. In all these guidelines there is emphasis on better control of risk factors and blood pressure levels to reduce the TOD. Also, combination therapy is emphasized by all guidelines from across the globe. Asians are genetically and socially different from people in other regions and hence physicians need to follow guidelines from their country while heavy a knowledge of the other guidelines as well, since hypertension is the commonest non communicable disease.

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