

Review Article

Hypertension in young adults and exploring its role in sudden cardiac death: expert opinion from India

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ABSTRACT

Hypertension, once considered a disease affecting older adults, is now alarmingly increasing in young Indian adults. Several lifestyle and environmental factors are linked to this sudden increase in hypertension in young adults in both urban and rural settings. However, there is a lack of guideline recommendations and clinical trial data for managing hypertension in young adults and adolescents, leaving clinicians with a lack of recommendation-based treatment for this population. Five focused group discussions including 60 eminent cardiologists from India were conducted to understand their perspectives on the approach to management of hypertension in young adults and whether it is linked to sudden cardiac death (SCD), particularly in those with left ventricular hypertrophy. Prevention of SCD in young adults, risk factors, and challenges in the early diagnosis and management approach for young adults with hypertension were also discussed. This review provides an overview of relevant literature and summarizes the perspectives of Indian experts on the merits of the fixed-dose combination of telmisartan plus bisoprolol that has shown promise in controlling hypertension in young adults.

Keywords: Hypertension, Sudden cardiac death, Young adult, β -blockers, Angiotensin receptor blockers, Fixed-dose combination, Bisoprolol, Telmisartan

INTRODUCTION

Hypertension, or high blood pressure (BP), affects 1 in 3 adults worldwide, and if left untreated, may lead to stroke, myocardial infarction (MI), heart failure (HF), and kidney dysfunction. The number of people affected by hypertension (BP of 140/90 mmHg or higher or taking medication for hypertension) doubled between 1990 and 2019 (650 million to 1.3 billion), and around 50% of them are unaware of their condition.¹ More than 75% of adults with hypertension belong to low- and middle-income countries.¹ According to the Fifth National Family Health Survey (NFHS-5), hypertension is a predominant risk factor for death and disability in India.²

A narrative review by Gupta et al on hypertension prevalence and control in India reported a high prevalence of young-age hypertension, predominantly in the less developed states.³ The NFHS-5 and the ICMR-India DIABetes (INDIAB) studies have reported considerable geographic variations in hypertension prevalence in India. Notably, in India the incidence of hypertension-related cardiovascular disease is significantly higher compared to more developed countries.³

Every year millions of young individuals, not only in India but around the world, die suddenly in the prime of their lives, with the prior to majority of deaths being attributable to sudden cardiac death (SCD).⁴ SCD leaves no

opportunity to revive or treat the patient as it usually occurs outside hospital settings.⁴ Globally the incidence of SCD is 0.03%–0.10% per year, translating to >2 million deaths annually, most of them happening in young individuals.⁵ SCD also accounts for over 60% of cardiovascular deaths.⁶ While the understanding of the underlying pathophysiology and causes of SCD is currently evolving, age, hypertension, smoking, diabetes mellitus (DM), dyslipidemia, obesity, and family history are considered some of the important risk factors.^{4,6}

With the rising incidence of hypertension in young individuals in India, it is important to explore whether hypertension plays an important role in the incidence of SCD. Some studies have pointed towards the link between hypertension and SCD, but further studies and insights from experienced cardiologists will be valuable in this aspect and will help in designing an infallible strategy to prevent SCD in India.^{7,8}

Despite the availability of several antihypertensive drugs, effective hypertension management in a resource-limited country like India is challenging due to factors such as low levels of awareness, inadequate screening, and a lack of optimal healthcare facilities, especially in rural and some urban areas. This expert opinion paper provides a comprehensive evaluation of the current situation of hypertension prevalence, diagnosis, and challenges in treatment, with a focus on young Indian adults.

Moreover, it delves into the possible causes of the increasing incidence of SCD, its risk factors, diagnosis, and prevention strategies, especially in young adults with hypertension. This paper also helps in leveraging insights from expert cardiologists on the use of fixed-dose combinations (FDCs; particularly angiotensin II receptor blockers [ARBs] and β -blockers), highlighting their potential positioning amongst the existing armamentarium against hypertension in India.

METHODS

The methodology for creating this expert opinion paper involved a multidisciplinary panel of cardiologists from across India to discuss the treatment approach for hypertension and SCD in young adults with hypertension. The meetings were moderated by experienced cardiologists. The experts discussed the following aspects, particularly with a focus on young hypertensives: increase in incidence, risk factors, challenges in controlling hypertension, screening, diagnosis, and management of hypertension and its possible role in SCD.

The insights from the meetings were collated in this expert opinion, which was reviewed and endorsed by some of the expert panelists who are the authors of this article.

These insights are further supported by recent literature available on hypertension and SCD.

WHAT SHOULD BE THE AGE CUT-OFF FOR DEFINING YOUNG HYPERTENSIVES IN INDIA?

Clinical evidence

The National Institute for Health and Care Excellence (NICE) guidelines and the European Society of Cardiology/European Society of Hypertension (ESC/ESH) guidelines typically consider young-onset hypertension as hypertension diagnosed before the age of 40.^{9,10} The American College of Cardiology/American Heart Association (ACC/AHA) guidelines do not assign a strict age cutoff for defining “young hypertensives,” instead, they consider a risk-based strategy for treatment decisions.¹¹

In the Indian hypertension guidelines (IGH IV), young hypertensives are generally considered to be individuals <55 years of age.¹² Hypertension prevalence in the age group <30 years was higher in India compared to central and eastern Europe, high-income Western world and other South Asian countries.

Expert opinion

In line with most international guidelines, some panelists considered <40 years as the good age cut-off for defining hypertensive young adults in India. However, the majority of the experts believed that in India the patients get affected by diseases a decade earlier than in the Western countries. Therefore, the Indian age cut-off should be reduced by 10 years and include patients <30 years. With this age cut-off, more young patients can be classified as hypertensives and initiated on pharmacotherapy for the prevention of coronary artery disease (CAD) and SCD (which also affected Indian patients a decade earlier).

WHAT IS THE BURDEN OF HYPERTENSIVE YOUNG ADULTS IN INDIA?

Clinical evidence

Overall prevalence of hypertension is significantly high (300–320 million) in India.¹³ The burden of hypertension is further complicated as there are marked disparities in awareness, diagnosis, treatment, and control rates across different regions and socio-demographic groups. Recent studies have shown that there is an increase in the incidence of hypertension in India, more notably in the rural population (25–35% in urban versus 15–20% rural). The prevalence in young and elderly individuals is 10.8% and 41.9%, respectively, whereas the prevalence in men and women is 24% and 21%, respectively.^{2,3}

There is a higher prevalence of young-age hypertension, especially in the less developed states.³ A study also found a comparatively higher prevalence among the youngest age group sampled (9.6% [95% CI 9.3–9.9%] among those aged 15 to 29 years).

Expert opinion

Key insights from the experts on the burden of hypertension in India are enlisted in Table 1.

WHAT IS THE PATIENT JOURNEY AND RISK FACTORS ASSOCIATED WITH HYPERTENSION IN YOUNG ADULTS?

Clinical evidence

Individuals with hypertension often experience challenges due to various contributing factors such as limited awareness of their condition, self-medication practices, physical distance to health facilities, availability of social support, high out-of-pocket expenditure, availability of medicines, and pill burden. Some patients use self-medication, including traditional herbal remedies, in Indian healthcare. While young adults largely from low socioeconomic backgrounds recognized hypertension as a lifelong disease, only older individuals were committed to medication adherence.¹⁴

There are several risk factors associated with hypertension. The non-modifiable risk factors include age, family history, genetic predisposition, sex, race, and ethnicity.¹⁵ Important modifiable risk factors are obesity, diabetes, diet, physical activity, stress, alcohol, and tobacco use. Poor dietary habits such as high salt intake and low potassium intake are also linked to hypertension.¹⁶ Obstructive sleep apnea (OSA) is one of the important risk factors associated with hypertension. It is hypothesized that OSA and hypertension are comorbid conditions that have adversely related pathophysiology, including

sympathetic hyperactivity, endothelial damage, and gut dysbiosis. Young adults who have hypertension of unknown etiology are susceptible to OSA.¹⁷

Hypertension in young adults is linked to an increased risk of cardiovascular (CV) events in middle age.¹⁸ Hypertension, if left untreated, is also associated with an earlier onset of coronary heart disease (CHD), HF, stroke, transient ischemic attacks, kidney dysfunction and/or end-organ damage.¹⁹ Two recent Indian studies, NFHS-4 and the Longitudinal Aging Study in India (LASI) reported low rates of hypertension awareness, treatment and control with significantly lower rates in the young adults compared to the older individuals.^{20,21}

Expert opinion

Risk factors for hypertension that are more commonly associated with young males are smoking and alcohol use. In females an important risk factor is polycystic ovarian disease (PCOD). Sedentary lifestyle, stress, unhealthy diet (rich in sodium), and obesity are some other common risk factors in young adults (Table 2). Complications in hypertensive young adults may not start early, and only 20% may have complications before they reach their 40s. Most hypertensive young adults are diagnosed during routine checkups, job fitness exams, or insurance screenings. They usually remain asymptomatic at the time of diagnosis. Life-threatening complications can occur even at stage 1 of HTN; of which the important complications are STEMI and acute coronary syndrome (ACS). The typical patient journey of hypertensive young adults can be summarized in Figure 1.

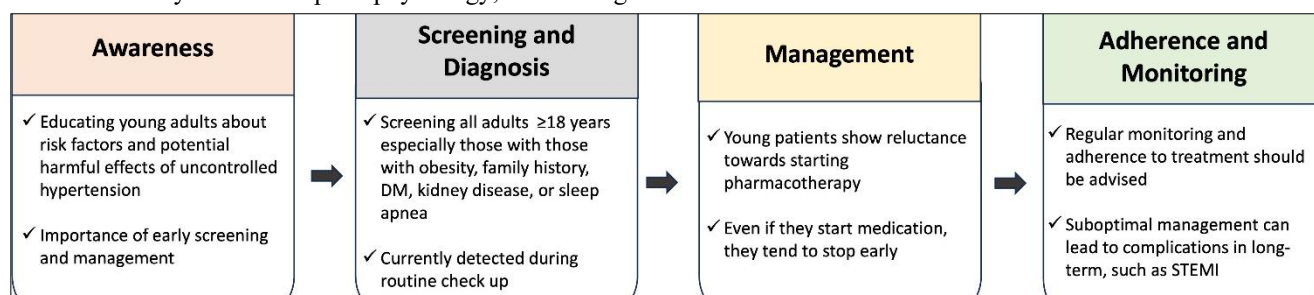


Figure 1: Patient journey of hypertensive young adults.

DM: Diabetes mellitus, STEMI: ST-elevation myocardial infarction.

Table 1: Expert opinion on the status of hypertension in India.

S. no.	Variables	Expert opinion
1	Prevalence of young hypertensives in	In cardiology settings, around 15–20% of all the patients for age cut-off <40 years, and around 10–15% of all the patients for age cut-off <30 years. In non-cardiology settings, the average percentage of young patients with hypertension is $\leq 5\%$ of all patients
2	Difference in prevalence in rural versus urban settings in young hypertensives	Currently, estimates suggest a 60% urban and 40% rural distribution. While urban areas still have a higher prevalence, rural hypertension rates are increasing quickly, approaching urban levels. Hypertension is more commonly observed in urban populations, likely due to lifestyle stress and sedentary habits

Continued.

S. no.	Variables	Expert opinion
3	Impact of socioeconomic/educational status on the burden of hypertension in young hypertensives	In young hypertensives, there is a divide based on socioeconomic status. People with low socioeconomic status tend to neglect the symptoms, which may be due to unawareness or lack of resources and report to healthcare settings only when the symptoms become severe. Well-educated individuals and those with strong socioeconomic backgrounds usually report few years earlier (when the symptoms like headache start to occur)

WHAT IS THE PATHOPHYSIOLOGY OF HYPERTENSION IN YOUNG ADULTS AND THE KEY DIFFERENCES COMPARED TO OLDER ADULTS?

Clinical evidence

Hypertension, especially in young adults, along with its related cardiovascular disorders is linked to sympathetic overactivity.²² In hypertension the higher sympathetic tone is linked to insulin resistance and dyslipidemia. Several mechanisms exist through which sympathetic overactivity possibly causes both hypertension and metabolic syndrome.²³ In India, around 60% of newly diagnosed hypertensive patients have sympathetic overactivity. Symptoms such as restlessness, excessive sweating, and hand tremors are indicators of sympathetic overactivity and should be taken into account while treating patients (especially young adults) with hypertension.^{22,24} Apart from sympathetic overactivity, a complex interplay of various elements of an integrated neurohumoral system, such as the renin-angiotensin-aldosterone system (RAAS), natriuretic peptides, and the immune system is involved in maintaining homeostatic BP levels. Other contributing factors are endothelial dysfunction and arterial stiffness.²⁵

Expert opinion

In young adults, hypertension is driven by sympathetic overactivity and endothelial dysfunction. These individuals often have increased heart rate and peripheral resistance. Smoking coupled with a sedentary lifestyle worsens endothelial damage, making hypertension more likely. Unlike in the elderly, arterial stiffness is not a major factor for hypertension in the young. Factors associated with the underlying pathophysiology of hypertension in young adults and some of the key differences from older adults are enlisted in Table 3.

WHAT ARE THE RISK FACTORS OF SUDDEN CARDIAC DEATH, AND THE ROLE OF HYPERTENSION IN SCD?

Clinical evidence

Age, hypertension, dyslipidemia, obesity, smoking, DM, and family history are considered the main risk factors for SCD. Studies have indicated that elevated BP and hypertension are linked to increased risk of SCD.^{7,8,26} The lifetime risk of SCD at the age of 30 is higher in 30% of individuals with hypertension. Further, a 20/10 mm Hg

increase in systolic/diastolic BP is linked to an additional 20% increase in the risk of SCD.²⁷ A meta-analysis has shown an increased risk of SCD with the diagnosis of hypertension and increasing systolic BP (SBP) with a nonlinear relationship between SCD and SBP.⁷ In patients with hypertension without cardiovascular disease, age, DM, electrocardiography (ECG) left ventricular hypertrophy (LVH), and 24-hour ambulatory pulse pressure are identified as independent long-term prognostic markers for SCD. Acute left ventricular heart failure (LVHF) is one of the common causes of SCD as a result of hypertension.⁸

In Western countries, CAD is a major risk factor of SCD, however, studies linking CAD to SCD in South Asian countries are lacking.²⁸ Around 60% of the world's CAD patients are South Asians, and CAD risk factors are present in them from a relatively young age.²⁹ The Indian SCD cohort includes predominantly men of relatively young age, which is clearly a distinction from the West which includes older men.³⁰⁻³² Other causes of SCD, especially in the younger population are myocarditis and endocarditis, cardiomyopathies, valvular heart disease, conduction system anomalies, cardiac tumors, aortic disease rupture, Brugada syndrome, and channelopathies. The main cause of SCD in the elderly is CAD or HF.³³

Risk stratification for SCD during follow-up should be individualized. A recent meta-analysis showed a high risk of long-term recurrence (41%) of ventricular arrhythmias and identified presentation with monomorphic ventricular tachycardia as a marker of poor prognosis. A recent review recommends community-based ECG screening once during school age and again during college age as a preventive measure against SCD (Figure 2).⁴

Expert opinion

LVH can cause abnormal signaling in heart, which in turn may lead to hypertension. Thus, LVH is one of the possible factors that may be a common link between hypertension with SCD. Markers such as C-reactive protein (CRP), lipoprotein a/Lp (a) are some of the markers that can be considered as predictors of atherosclerotic cardiovascular disease (ASCVD)/SCD. Further studies, especially in young adults from India are needed to corroborate it further. Opinion from experts on the investigations that can be used in clinical practice for prediction of SCD in India, and proposed algorithm for prevention of SCD in young hypertensives in India are given in Table 4 and Figure 3, respectively.

HOW SHOULD YOUNG ADULTS BE DIAGNOSED/SCREENED FOR HYPERTENSION AND WHAT ARE THE FACTORS DELAYING DIAGNOSIS IN YOUNG ADULTS?

Clinical evidence

Hypertension guidelines do not differentiate between screening and diagnosis of young and older adults (Table 5). Office BP monitoring (OBPM), Home BP monitoring (HBPM), and Ambulatory BP monitoring (ABPM) should be done as per standard guidelines such as ESC/ESH Guidelines.³⁴ Some of the important biomarkers for hypertension onset are serum lipids (LDL and VLDL-derived cholesterol levels) and glucose metabolism abnormalities. The European Atherosclerosis Society (EAS) consensus (2022) recommends Lp(a) test at least once in lifetime for adults.³⁵

Expert opinion

In India, the diagnosis of hypertension is primarily based on OBPM as it is the most accessible and widely used method. HBPM and ABPM are ideal, but they are used only for selected individuals. In clinical settings, BP is often measured once by either the doctor or nurse, but ideally, it should be measured multiple times (at least three measurements with one-minute intervals) to obtain an accurate reading. However, this practice may not always be followed consistently across all settings. Key insights from experts on the diagnosis and screening of hypertension in young adults are enlisted in Table 6. Some of the factors responsible for delay in the diagnosis of hypertension in young adults are given in Figure 4.

WHAT SHOULD BE THE TREATMENT STRATEGY FOR HYPERTENSIVE YOUNG ADULTS?

Clinical evidence

ESC/ESH Guidelines (2024) do not recommend different treatment strategies for the management of hypertension in young and older adults (Figure 5A).³⁴ However, the Indian Guidelines on Hypertension IV (IGH IV) recommend different treatment strategies for younger and older patients with hypertension (Figure 5B).³⁶ The Indian Guidelines recommend the use of angiotensin-converting enzyme inhibitors (ACEis) or ARBs or newer β -blockers for younger individuals. These guidelines also recommend the use of newer β -blockers in hypertensive young adults in special situations, such as angina, post-MI, tachyarrhythmia, or HF.

Guidelines, including the ESC/ESH and Indian guidelines on hypertension-IV (2019), recommend the use of ACEi or ARBs as a first-line therapy for hypertension (Figure 5).^{34,36} β -blockers can be vital in managing hypertension in young adults due to sympathetic overactivity that is associated with the development of hypertension

especially in young adults in India.²⁴ ARBs are better tolerated by patients compared to the other major anti-hypertensive classes of drugs. Cardiovascular protective effects of ACEis and ARBs are rather similar, but compared with other agents, ARBs may offer better protection against stroke.³⁷ FDCs have been recommended by most of the hypertension management guidelines due to the potential of increasing patient compliance and convenience while achieving better BP control.³⁸ Several studies have supported the use of a combination of ARBs and β -blockers in the effective management of hypertension in Indian patients, especially in hypertensive young adults. An Indian cross-sectional study has shown that clinicians prefer a combination of ARBs and β -blockers as the first-line treatment for managing hypertension in young adults. β -blockers are the drug of choice, mainly due to their ability to manage sympathetic overactivity that is largely found in this population.³⁹

A recent study on identifying drug prescription patterns for newly diagnosed hypertension patients in India, showed that ARBs were the most commonly prescribed drugs (79%), followed by calcium channel blockers (CCBs; 55%) diuretics (27%) and β -blockers (17%).⁴⁰ This suggests a need for better awareness of β -blockers, as these should be preferred for newly diagnosed young patients with hypertension, especially those with an increased HR.

Expert opinion

Key insights from experts on the use of ARBs and β -blockers for hypertensive young adults are enlisted in Table 7.

WHAT ARE THE ADVANTAGES OF BISOPROLOL AND TELMISARTAN FDC?

Clinical evidence

An open-label, phase IV, multicentre, prospective study has shown that bisoprolol was efficacious in stage 1 hypertension in Indian adults, it significantly reduced SBP, DBP, and HR. Further, the combination of telmisartan + bisoprolol significantly reduced SBP in younger adults compared to telmisartan + metoprolol.⁴¹ Additional benefits of bisoprolol in some other conditions such as CAD, chronic obstructive pulmonary disease (COPD), LVH and HF are enlisted in Table 8.^{39,42-44} The FDC of telmisartan + bisoprolol has shown superiority over the combination of telmisartan + metoprolol FDC in effectively controlling SBP in young patients. This combination has demonstrated effectiveness in the management of hypertension, along with benefits such as reducing cardiovascular risk and improving organ function.⁴⁵ A phase 3 multicentric clinical trial has established the efficacy, tolerability, and safety of the FDC of telmisartan 40 mg + bisoprolol 5 mg for the management of stage 1 and stage 2 hypertension.⁴⁶

Expert opinion

Telmisartan is the most preferred ARB in India due to its high potency for blocking AT1 receptors and its long-acting effects, with a duration of almost 24 hours. Telmisartan also has the added benefit of peroxisome proliferator-activated receptor (PPAR) gamma activity, which can help reduce blood sugar levels in diabetic patients. It has OD dosing and is well tolerated. Bisoprolol is the most preferred β -blocker due to advantages such as cardio-selectivity, ease of dosing (up to 10 mg, OD), better pulsatory reduction and atopic reduction, pleiotropic

effects in COPD, exercise tolerance, and prevention of SCD and MI.

Telmisartan + bisoprolol is a welcome combination which has been useful in the management of hypertension in young adults. Bisoprolol helps in reducing ventricular arrhythmias, ventricular premature beats (VPDs), and lowers the risk of SCD, making it an ideal choice. Together, telmisartan and bisoprolol provide comprehensive cardiovascular protection, addressing both hypertension and arrhythmic risks. Some key insights on the rationality of using the combination of telmisartan + bisoprolol are given in Table 9.

Table 2: Important risk factors associated with hypertension in young versus older adults as per key insights from experts.

S. no.	More common in young adults	More common in older adults
1	Use of tobacco and alcohol	Age-related arterial stiffness
2	Stress and lack of sleep	Diabetes mellitus
3	Obesity and poor diet	Dyslipidemia
4	Sedentary lifestyle	
5	Polycystic ovarian disease	

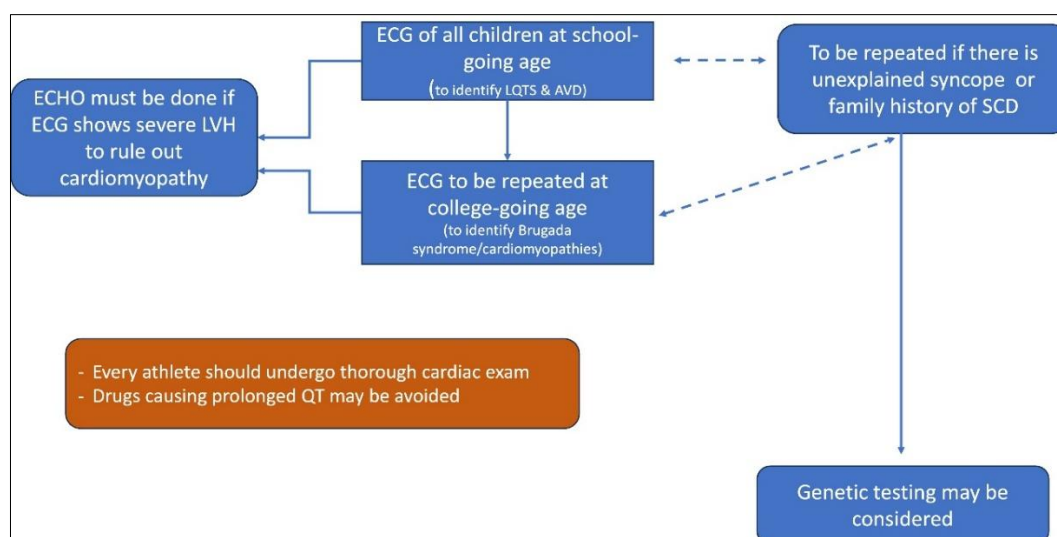


Figure 2: Proposed algorithm for screening of SCD at the community level.

AVD: Arrhythmogenic ventricular disorder; ECG: electrocardiography; ECHO: echocardiography; LQTS: long QT syndrome; LVH: left ventricular hypertrophy; SCD: sudden cardiac death.

Table 3: Factors linked to underlying pathophysiology in young and older adults.

S. no.	Young adults with hypertension	Older adults with hypertension
1	High incidence of sympathetic overactivity, which may be attributed to tobacco use, obesity, and overall unhealthy lifestyle	Baroreceptor sensitivity and RAAS signaling decrease in older age
2	Mixed systolic and diastolic HTN is seen	Isolated systolic HTN due to increased arterial stiffness
3	Diabetes, obesity, and smoking cause chronic inflammation and may cause endothelial dysfunction in young population (although it is less common)	Endothelial dysfunction and arterial stiffness are more common and are related to age
4	Obstructive sleep apnea can cause chronic, hypoxia which can trigger hypertension and SCD	

HTN: Hypertension; RAAS: renin-angiotensin-aldosterone system; SCD: sudden cardiac death

Table 4: Expert opinion on the important investigations for the prevention of SCD.

S. no.	Investigations	Expert opinion
1	Ejection fraction	Lower the ejection fraction, more is the future possibility of SCD
2	ECG (GEH) and J point elevation	Considered good ECG markers for the prediction of SCD, whereas the less established ones are SVG and spatial QRST angle
3	GLS	It is more sensitive and an earlier marker of MI but has low availability at community level in India
4	CT coronary angiography	This test can be performed in patients with a high degree of suspicion and is not a routine test
5	Cardiac MR	In myocarditis cases (LVH, myocarditis, or family history of SCD) it can be considered
6	Lp(a)	This test can be performed at least once in a lifetime, as it is an additional risk enhancer, and not a direct risk factor of SCD

CT: Computed tomography; ECG: electrocardiography; GEH: global electrical heterogeneity; GLS: global longitudinal strain; Lp(a): lipoprotein(a); LVH: left ventricular hypertrophy; MI: myocardial infarction; MR: magnetic resonance; SCD: sudden cardiac death; SVG: spatial ventricular gradient

Table 5: Diagnosis of hypertension as per ESC/ESH guidelines.

Investigations	Diagnosis
Basic investigations	
Patient history	Personal history, CV risk factors, symptoms of HMOD, CVD, stroke or CKD
Physical examination	Body habitus and BMI, signs of HMOD, signs of secondary HTN, resting pulse rate, level of frailty,
Laboratory tests	In blood: Creatinine, eGFR, potassium and sodium, In urine: multicomponent dipstick test, urinary albumin-creatinine ratio
Other investigations	12-lead ECG
Extended investigations	
HMOD (to be selected if necessary and available)	Echocardiography, MRI, coronary calcium score (heart); Ultrasound, doppler ultrasound (kidney); Carotid ultrasound; pulse wave velocity, ankle-brachial index; CT, MRI, cognitive function tests (brain); funduscopy, retina microvasculature (eye)

BMI: Body mass index; CRP: C-reactive protein; CKD: chronic kidney disease; CT: computed tomography; CVD: cardiovascular disease; ECG: electrocardiography; eGFR: estimated glomerular filtration rate; HTN: hypertension; HMOD: hypertension mediated organ damage; KFT: kidney function test; Lp(a): lipoprotein a; MRI: magnetic resonance imaging

Table 6: Expert opinion on the diagnosis and screening of hypertension in young adults.

S. no.	Expert opinion
1	Clinicians should follow global guidelines for HTN.
2	Clinical hypothyroidism is also very important in Indian settings, particularly in females as hypothyroidism is linked to atherosclerosis.
3	Screening for secondary hypertension should be performed in young adults which may help in deciding the investigations required especially in difficult-to-treat and refractory HTN
4	Tests for hypokalemia/hyperkalemia should also be considered as these can be associated with specific types of secondary HTN. Around 10-30% patients with primary hyperaldosteronism will have hypokalemia. Newer therapies in HTN will address this unmet need in young hypertensive patients.
5	Urine examination is an important baseline test, which can be followed up with full KFT. In high-risk patients or those who have abnormal KFT (or urine examination), a renal artery doppler study can be performed, followed by renal CT angiography, which is especially important in Indian patients to avoid missing a secondary cause.
6	For patients reporting blurring of vision, retinopathy should be assessed. Recent guidelines have included fundus examination to assess retinal involvement
7	Three parameters for hypertensive young adults without severe flash pulmonary oedema: peripheral arterial pulsation, auscultating the renal bruits, and thyroid assessment to check for hypothyroidism
8	Lp(a) should be performed at least once in a lifetime. Lipid profile, blood glucose monitoring, and CRP tests can be performed in routine practice

CRP: C-reactive protein; CT: computed tomography; HTN: hypertension; KFT: kidney function test; Lp(a): lipoprotein(a)

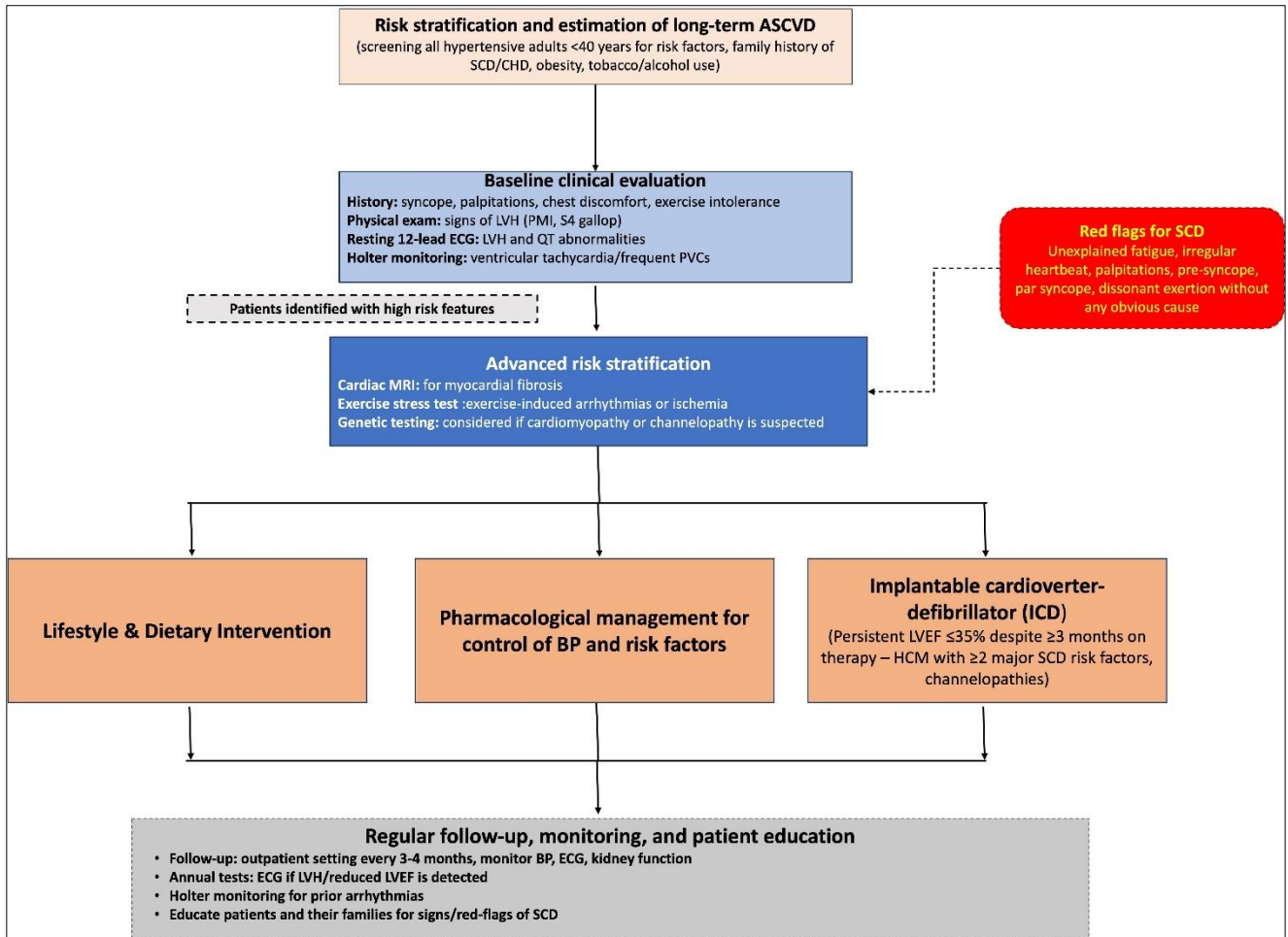


Figure 3: Proposed algorithm for prevention of SCD in India based on expert insights.

ASCVD: Arrhythmogenic ventricular disorder; BP: blood pressure; ECG: electrocardiography; ECHO: echocardiography; HCM: hypertrophic cardiomyopathy; LQTS: long QT syndrome; LVH: left ventricular hypertrophy; LVEF: left ventricular ejection fraction; MRI: magnetic resonance imaging; SCD: sudden cardiac death



Figure 4: Factors delaying diagnosis of hypertension in young adults.

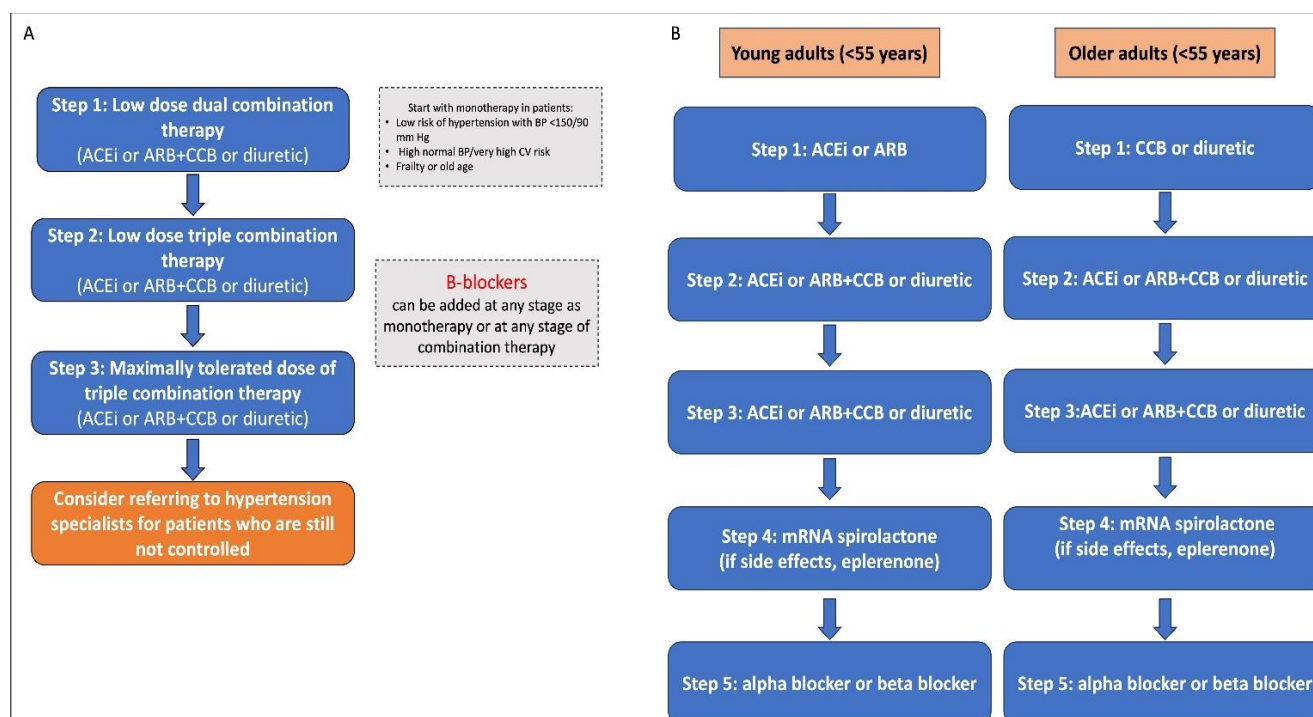


Figure 5: Guideline recommendations for pharmacological management of hypertension: (A) ESC/ESH guideline recommendations and (B) Indian guidelines on hypertension-IV recommendations.

ACEi: Angiotensin-converting enzyme inhibitor; ARB: angiotensin II receptor blocker; BP: blood pressure; CCB: calcium channel blocker; CV: cardiovascular; MRA: mineralocorticoid receptor antagonist; mmHg: millimetres of mercury

Table 7: Expert opinion on the indications for use of ARBs or β -blockers in young patients.

S. no.	Expert opinion
1	Fixed-dose combinations help in reducing the pill burden, thereby increasing treatment compliance
2	If tachycardia (HR >100) is present, then β -blockers should be preferred for treatment of hypertension. β -blockers upfront can be considered for hypertensive young adults but should be used with caution as they may cause erectile dysfunction.
3	In the absence of tachycardia, ARBs should be the drug of choice.
4	If the patient does not have adequate BP control with standard therapy, then a β -blocker can be added along with ARBs.
5	Female patients who are pregnant or expecting should not use ARBs, especially in the 1st trimester.
6	β -blockers are generally not preferred as monotherapy, as they cannot achieve all the parameters required for efficient hypertension control. However, when combined with ARBs, almost all the parameters are controlled

ARB: Angiotensin II receptor blocker; β -blockers: beta blockers; BP: blood pressure; HR: heart rate.

Table 8: Benefits of bisoprolol.

Condition	Benefits
Coronary artery disease¹	Effective BP control, effective reduction of resting heart rate, improved composite cardiac clinical outcome independent of BP-lowering effect
Hypertension²	Advantageous over other cardio-selective beta-blockers due to better potency and tolerability
Hypertensive LVH³	Provides reverse left ventricle remodelling, provides antiarrhythmic action, should be considered in hypertensives to prevent VT/VF and SCD
COPD⁴	Improves lung function, improves exercise performance, reduces inflammatory markers
Heart failure⁵	Enhances left ventricle function, decreases hospitalization risk, increases survival

BP: Blood pressure; COPD: chronic obstructive pulmonary disease; LVH: left ventricular hypertrophy; SCD: sudden cardiac death; VF: ventricular fibrillation; VT: ventricular tachycardia

Table 9: Rationale for the use of the combination of long-acting ARBs (like telmisartan) β -blockers (like bisoprolol) in young Indian patients.

S. no.	Expert opinion
1	Bisoprolol can be given to patients with COPD, as it improves lung function and exercise performance in these patients. It is also beneficial in patients with hemodialysis as its effect remains after dialysis. In addition, it does not have effect on insulin sensitivity, can be a drug of choice for patients with diabetes.
2	Telmisartan is most the preferred ARB considering its price, availability, and efficacy. It is long acting and has CV benefits along with reducing BP.
3	Telmisartan and bisoprolol is a good combination for those with a high resting HR (80-90), and sympathetic overactivity or ischemic heart disease as both the drugs are long acting, well tolerated and cardioprotective.

ARB: Angiotensin II receptor blocker; BP: blood pressure; COPD: chronic obstructive pulmonary disorder; CV: cardiovascular; HR: heart rate

CONCLUSION

The incidence of hypertension in young adults is rapidly increasing in India owing to lifestyle and environmental factors such as obesity, and stress. It is one of the key public health concerns for adults even below the age of 40. Initiation of an early and appropriate antihypertensive treatment in this population is important to avoid vascular and organ damage. However, age-specific recommendations for managing hypertension in young adults are lacking, as current guidelines often extrapolate from older cohorts. There is also a lack of evidence from randomized trials to guide pharmacotherapy in young adults who have a low 10-year ASCVD risk. This expert opinion paper tries to bridge this gap by defining the age cut-off for young adults with hypertension, and identifying unique lifestyle factors in the young adults, such as obesity, diet rich in sodium, sedentary lifestyle, increased stress, and alcohol/tobacco consumption as the main contributors for the increasing incidence of hypertension in this population. Sympathetic overactivity is considered as one of the key contributors of hypertension in young adults supporting the use of ARBs and beta blockers as one of the preferred classes of anti-hypertensive drugs, especially in the cases of resistant hypertension or in young adults with comorbidities. The experts also indicated that the FDC of telmisartan and a cardio-selective β -blocker such as bisoprolol can be an ideal antihypertensive treatment. Uncontrolled hypertension is also identified as one of the possible risk factors of SCD. The FDC of Telmisartan and bisoprolol is effective in treating hypertension in young and may also help in preventing SCD. Additionally, this FDC is cost-effective and reduces the pill burden (a known cause of lack of adherence to anti-hypertensive medication), enabling patients to continue long-term treatment.

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