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# Asian management of hypertension: Current status, home blood pressure, and specific concerns in India

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## Abstract

Systemic hypertension and its related complications are the important contributing factors for major adverse cardiovascular events all over the world. Evidence from Asia and even from India reveals that both its incidence and prevalence are increasing even in young population both in urban and rural areas. The HOPE (Hypertension Cardiovascular Outcome Prevention and Evidence) Asia network data clearly say that most of these hypertensive patients are undiagnosed and undertreated. Even among the treated patients, the regular follow-up visits and compliance of antihypertensive drug intake are not effective. The blood pressure variability (BPV) and the exaggerated morning blood pressure surge (MBPS) leading to high cardiovascular mortality and morbidity have been demonstrated in many studies. The role of home blood pressure monitoring (HBPM) to detect BPV and MBPS to treat hypertensive patients more effectively has been published by the HOPE Asia Network. This article is to review the evidence and literature from the Indian perspective and the role of HBPM for the effective control of hypertension in general population.

## 1 | INTRODUCTION—CURRENT STATUS OF CARDIOVASCULAR DISEASE (CVD) INCIDENCE AND HYPERTENSION IN INDIA

Systemic hypertension is a major risk factor for cardiovascular and cerebrovascular diseases[1] accounting for approximately 45% of global cardiovascular disease mortality and morbidity.[2] Cardiovascular diseases are likely to be the major cause of death and physical disability in India by 2020, as per the report of World Health Organization (WHO). Hypertension is responsible for 57% of all stroke deaths and 24% of coronary deaths, in India.[3] Indians experience CVD deaths at least 10 years earlier than in other developed countries. The study group of Global Burden of Disease estimates that, 52% of total CVD deaths occur below the age of 70 years in India, compared with those who lived in developed nations where it is 23%.[4]

A meta-analysis[5] of various studies done in different parts of India revealed that overall prevalence for hypertension in India was 29.8%. Further analysis showed difference in the prevalence for hypertension in urban (33.8%) and rural (27.6%) population. However, this difference is gradually getting narrow due to changes in dietary and lifestyle changes. Regional estimates for the prevalence of hypertension in rural India were not uniform, that is, 14.5% (13.3-15.7), 31.7% (30.2-33.3), 21.1% (20.1-22.0), and 18.1% (16.9-19.2) for north, east, south, and west India, respectively; and 28.8% (26.9-30.8), 34.5% (32.6-36.5), 35.8% (35.2-36.5), and 31.8% (30.4-33.1) for urban north, east, west, and south India, respectively. Overall, about 33% urban and 25% rural Indians suffer from high blood pressure (BP). However, only one-fourth of the rural patients and about 42% of urban Indians are aware of their hypertensive status. Out of them, only 25% rural and 38% of urban Indians are being treated for hypertension. Possibly about 10% of rural and 20% of urban Indian hypertensive population have their blood pressure (BP) under control.

## 2 | BLOOD PRESSURE VARIABILITY AND ROLE OF HOME BP MONITORING (HBPM)—CURRENT STATUS IN INDIA

Blood pressure variability is an intrinsic property of BP, which is essential for physiological adaptability.[6] It is a dynamic variable and

  

shows circadian variation, being higher during the day (or awake periods) and lower at night (or during sleep). The adverse cardiovascular events are more in the morning hours.[7-12] According to the resonance hypothesis, extreme BP variability (BPV), especially the early morning blood pressure surge (EMBS), results in large dynamic surges triggering adverse cardiovascular events.[13]

### 2.1 | Current status of ABPM (ambulatory BP monitoring) and HBPM in India—A literature review

There are limited data from India on ABPM and HBPM. One study[14] shows that early detection of end-organ damage like left ventricular hypertrophy is a cost-effective method by nocturnal BP measurement using an HBPM device. In a study in 122 consecutive patients with diabetes, poor glycemic control and insulin resistance predicted the occurrence of morning BP surge.[15] One more small study[16] analyzed the role of genetic factors in BPV among the Kumba community, which showed significant differences in 24-hour mean BP values, BPV, and nocturnal dipping in systolic BP. One study has demonstrated the feasibility of ABPM in children too.[17] In another study in children with CKD on dialysis, there was a high prevalence of ambulatory hypertension, up to 90%.[18] ABPM in these children revealed that almost half of them had inadequate BP control. The diagnosis of hypertension was missed in seven out of 13 children with left ventricular hypertrophy when clinic BP alone was used to diagnose hypertension. ABPM subsequently detected hypertension in all these children.

## 3 | DATA OF THE INDIAN SUB-ANALYSIS FORM ASIA BP @HOME STUDY

Recent results of Asia BP@Home study[19] (Figure1) consisting of multinational Asian population, including India emphasized the role of home BP monitoring. There were significant country and regional differences in the demographics of study participants and home BP control status. Of the total studied hypertensive patients of 1443 of Asia BP@home study, 97 patients were enrolled from India (66% of the study population were men and 34% were women—figure given below). Using a morning home systolic BP (SBP) cut-off of <135 mm Hg, well-controlled BP was observed in 79% of patients. When cut-off values were changed to the 2017 AHA/ACC threshold (SBP < 130 mm Hg), 61% of patients were well controlled for morning home SBP. As compared to other Asian countries data, regarding the control of hypertension based on Home BP monitoring, Indian population showed reasonably well-controlled patients. It may be due to a single-center recruitment of hypertensive patients consisting of a small sample size (n = 97), compared with 1300 million population of India. Patients are already on well-controlled treatment coming for regular follow-ups. This also emphasizes the role of primary physician, in educating patients and motivating for strict drug compliance and regular follow-up visits.

## 4 | INDIAN GUIDELINES ON HYPERTENSION AND PERSPECTIVE ON HBPM

The Indian guidelines on hypertension are developed by Association of Physicians of India (API), Cardiology society of India (CSI), and Indian college of Physicians and Hypertension society of India. First guideline was released in 2001. The third guidelines were published in 2013.[20] However, these guidelines are almost similar to NICE guide lines. Recently, a consensus document on the role of HBPM is also published.[21]

Benefits of HBPM over other Methods of Blood Pressure Monitoring.

- Major advantage of HBPM is the ability to take multiple readings of blood pressure during the day and for several days to months.
- White-coat hypertension can be diagnosed as the blood pressure is measured by the patient at home, that is, away from the clinical/hospital settings.
- Home-based monitoring may providea better prediction of hypertension-induced end-organ damage or other complications compared with the office settings though this has not been unequivocally proved.
- Advantagesof HBPM over 24-hour continuous ABPM include feasibility of long-term monitoring, easy and wide availability of equipment to monitor blood pressure, convenience, and possibly economic benefits for the patient.
- Results of HBPM are reproducible.
- May improve treatment compliance resulting in better hypertension control rates.
- May be useful in deciding timing of antihypertensive drug administration.

## 5 | TRADITIONAL ANTIHYPERTENSIVE THERAPIES—THE INDIAN GUIDELINES AND ANTIHYPERTENSIVE DRUG THERAPIES IN INDIA

India is a large country having various cultures and medical practices. Apart from Allopathy, Ayurveda, Homeopathy, Unani, and Siddha are other alternative medical practices in India to treat various diseases, including hypertension. Commonly used medicines in Ayurveda for hypertension are Sarpagandha (*Rauvolfia serpentina*), Arjuna (*Terminalia arjuna*), Dalchini (*Cinnamomum verum*), Jatamansi (*Nardostachys jatamansi*), and Punarnava (*Boerhavia diffusa*).[22,23] Homeopathy medicines for hypertension are Rauvolfia serpentina and Glonine (Glonoinum).[24,25] However Unani and Siddha systems give more emphasis on lifestyle modification and balanced diet. There are no authentic data available that how much Indian population is using alternate medical systems to manage hypertension.

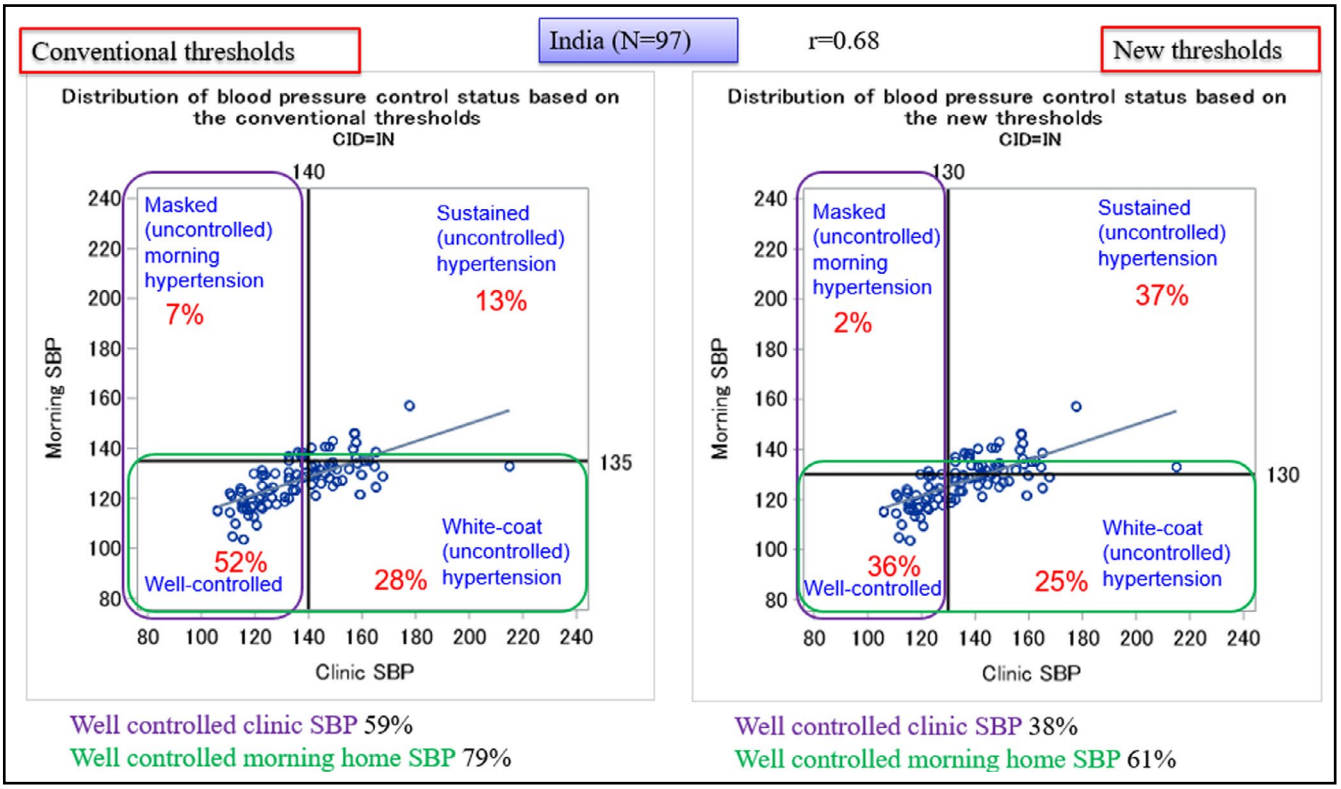


**FIGURE 1** Data of the Indian sub-analysis from Asia BP @Home study—distributions of blood pressure and the control status based on conventional thresholds vs new thresholds in Indian patients

Earlier studies from India revealed that most of the hypertensive patients were at least on two antihypertensive drugs.[26] Recent study shows that most of the Indian practitioners follow the International guidelines, using combinations of antihypertensive drugs for effective BP control.[27] Recent publications form India analyzed prescribing pattern and cost implications and rationality of antihypertensive drugs. In a tertiary care center study, calcium channel blockers (CCB) were most commonly prescribed drugs and 87.27% prescriptions were found rational.[28] In another study of 645 hypertensive patients, angiotensin receptor blockers (ARB) were most commonly prescribed drug.[29] In a recent study (n = 100), the most commonly prescribed drugs were calcium channel blockers (49.81%) and beta-blockers (12.73%) among the various antihypertensive agents.[30] In one more tertiary center study consisting of 394 patients, CCBs are ARBs were the most commonly prescribed antihypertensive drugs either alone or in combination. Among the prescribed drugs, patients with monotherapy were —50.76%, dual drug therapy were — 42.13%, triple drug therapy were —6.09%, and four drug combination were —1.01% , for the hypertension management.[31]

## 6 | HYPERTENSION MANAGEMENT IN INDIA—SPECIFIC CONCERNS AND REMARKS

Hypertension is one of the major public health problem in India. India is a large developing country with various populations of mixed languages and economic status. Some parts of the country especially rural India is in developing status, whereas the urban population can be compared with any other developed country. Increasing urbanization and unhealthy lifestyle changes are responsible for increased number of cardiovascular and cerebrovascular diseases leading to early mortality and morbidity, even in young Indians. This diversity is one important hurdle for exact epidemiological studies of whole Indian population. However, overall growing status of health and medical facilities in our country are now encouraging to provide our own population data. Both the government and private medical bodies including HOPE Asia Network are now actively involving to reduce the cardiovascular events. The guidelines on hypertension management including ambulatory and home BP monitoring are clearly established in India now and being practiced by many general practitioners.

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