

Classification of Hypertension: How Does Inclusion of Prehypertension Affect Health Care in Indian Scenario?

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Abstract

Hypertension, type 2 diabetes and obesity are the silent killers of the society. Last one decade has witnessed a paradigm shift in defining what constitutes a detrimental level of blood pressure? Entire classification of hypertension has been revised by JNC VII. A distinct concept of prehypertension (systolic blood pressure 120-139 and diastolic blood pressure 80-89 mm Hg) has emerged out of the belief that slightest increase in normal blood pressure carries adverse cardiovascular morbidity. This has wide epidemiological, clinical, therapeutic and economical ramifications. There is also a genuine fear that prehypertension may progress to hypertension over the years. Moreover, prehypertension has been more commonly reported among young generation. It is reported to be present in more than half cases among diabetic subjects. Stress, obesity, diet, family history, middle income group and central serous chorioretinopathy have been recognized to be risk factors for prehypertension. While realizing the prognostic implications of raised blood pressure, one must restrain himself from over stretching the dangers of prehypertension as the aim of the whole exercise is to reduce the risk of CAD and stroke, not merely the level of blood pressure. Adoption of healthy lifestyle measures which include abstinence from tobacco/ smoking, eating vegetables, fruits, and increasing physical activity along with yoga would hopefully pave way for the prevention, regression and reversal of prehypertension as well as hypertension.

Key words: Hypertension, prehypertension, Indian scenario

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Introduction

Hypertension (HTN), type 2 diabetes mellitus (T2DM) and obesity are considered to be silent killers of the modern society. India with its population crossing one billion mark is facing major brunt of these diseases on account of several reasons like changes in lifestyle consequent to economic improvement, migration to cities and urbanization (1), ageing, ethnicity and increasing population. It is estimated that India presently has 200 million of HTN, 35.8 million of CAD, 31.0 million of T2 DM and 1.2 million of stroke subjects. These figures are based on 2001 census and the current prevalence rate and total population to be 1027 million. If the current rising trend of these cardiovascular diseases (CVDs) is not contained well in time it is feared that the bare minimum cost of managing and treating these diseases will be beyond our economical means and resources.

Even the slightest increase in the blood pressure more than normal (120/80 mm Hg) and blood glucose (hyperglycemia) are associated with increased cardiovascular morbidity and mortality (2). Often their seeds are sown in intrauterine and early natal life (3). Taking above points into consideration there has been radical change in staging

hypertension and diabetes. Last one decade has witnessed gradual evolution of the distinct concept of prehypertension and prediabetes so much so that the entire classification of hypertension has been revised by JNC VII (4). This has wide epidemiological, clinical, therapeutic and economical ramifications (5). Therefore, a rational and balanced reappraisal of the prehypertension is urgently required. Present review tries to address these issues in Indian perspective.

Classification of Hypertension

Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNCVII) has set new guidelines for defining hypertension, its prevention and management (4). (Figure 1)

Accordingly blood pressure has been classified as normal (systolic blood pressure <120 / diastolic blood pressure <80 mm Hg), prehypertension (systolic blood pressure 120-139 / diastolic blood pressure 80-89 mm Hg), hypertension stage 1 (systolic blood pressure 140-159 / diastolic blood pressure 90-99 mm Hg) or hypertension stage 2 (systolic blood pressure >160 / diastolic blood pressure >100 mm Hg). One of the important key messages is that the risk of CVD,

Blood Pressure Classification	SBP mmHg	DBP mmHg
Normal	<120	and < 80
Prehypertension	120-139	or 80-89
Stage-1 Hypertension	140-159	or 90-99
Stage-2 Hypertension	≥ 160	or ≥ 100

Figure 1. Classification of blood pressure as per JNC VII

beginning at 115/75 mm Hg, doubles with each increment of 20/10 mm Hg. Individuals who are normotensive at 55 years of age have a 90% lifetime risk of developing hypertension. JNC VII recommendations are supported by data from a large clinical trial which suggest that blood pressure differences between treatment groups predict differences in outcome for all major cardiovascular events, even when the blood pressure differences are seemingly small. Moreover, there is no blood pressure threshold below which benefits cease, down to 115/75 mm Hg (6).

Prehypertension

Framingham studies have demonstrated that the relationship between blood pressure and risk of cardiovascular disease events is continuous, consistent and independent of other risk factors and prehypertensives have greater chance to develop hypertension (7). (Fig 2)

These findings form the basis of JNC VII recommendations. If we apply JNC VII criterion strictly in our scenario it is feared that almost 50% of Indian population may be prehypertensive (8,9,10,11). (Fig 3)

Interestingly there is an inverse relation between prevalence of prehypertension and age. Its victims are mostly young men and particularly students. There have been a number of reports, particularly from metropolis cities of India, showing higher prevalence of prehypertension in young individuals (9, 12, 13). (Fig 4)

This is of great relevance as the chance of progression to hypertension is high in such individuals. The younger people in India are stressed out because of heavy competition in academic fields and also for securing employment. Could increasing stress be also a contributory factor for increasing prevalence of coronary artery disease among young in India (14)? Hence it is also possible that

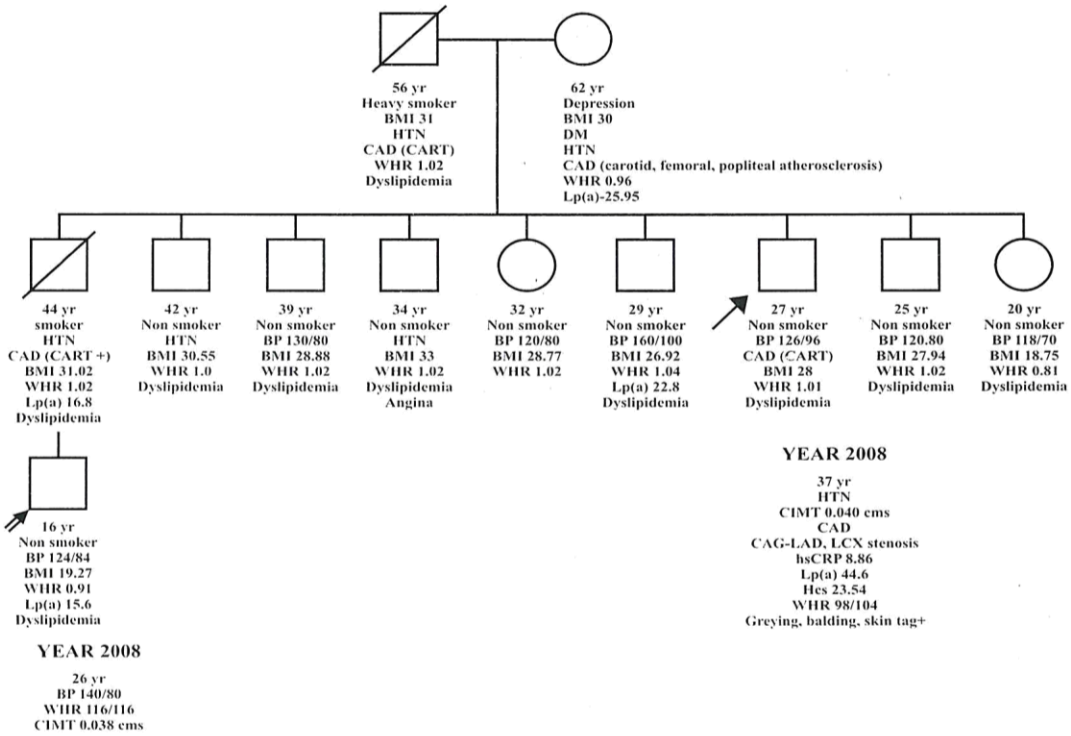


Fig 2. Pedigree chart showing progression of cardiovascular risk factors in two generations of a family, initially in 1998 and now in 2008. The patients under consideration are being marked by arrow separately. The pedigree shows interlink between heredity, central obesity, prehypertension evolving into hypertension and CAD.

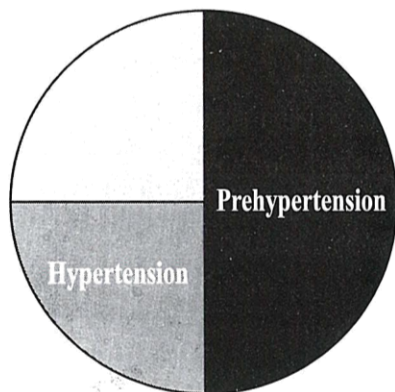


Fig 3. Findings showing prevalence of hypertension and prehypertension in India in 2006

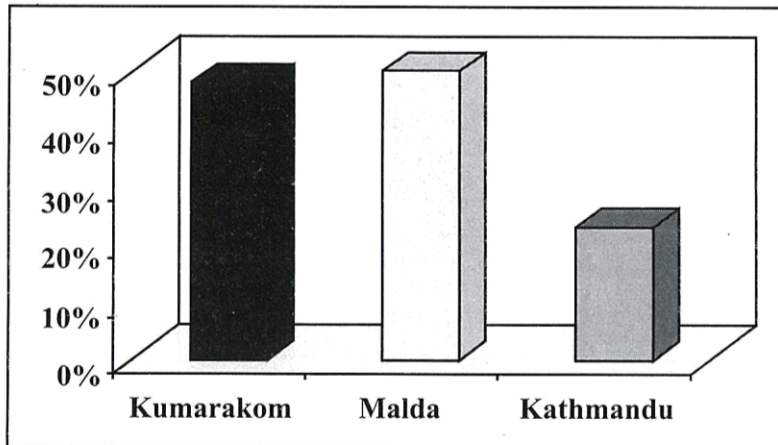


Fig 4. Prevalence of prehypertension: a little less than 50% of Indian population is prehypertensive

the young stressed individuals with prehypertensive level of blood pressures may be at risk to develop ischemic heart disease early. However, no follow up study from India based on JNC- VII criteria is available on this count. Longitudinal studies involving regular check up of blood pressure of students from secondary level as well as of laborers should be carried out in future to study the causal relationship between age-specific prehypertensive level of blood pressure and subsequent development of hypertension and coronary artery disease.

Obesity, diet, family history and middle income group have been recognized to be risk factors for prehypertension in a study from southern

metropolis of India (13). The incidence of prehypertension among diabetics has been reported to be more than half among this population (15). Interestingly prehypertensive patients tend to have higher insulin resistance and protein glycation compared to normal subjects. In another study it was observed that those prehypertensive subjects had significantly increased levels of total cholesterol, direct LDL-cholesterol, non-HDL cholesterol, Apo-B and hs-CRP. These findings explain the interlink between prehypertension and diabetes and enhanced atherosclerosis so often seen in clinical experience (16,17). Prehypertension has also been more commonly observed in patients with central serous chorioretinopathy (18).

Cost Implications

Assuming that half of the Indian population is suffering from prehypertension, i.e. 0.5 billion people would be estimated to be prehypertensive. It is feared that 10% of them might require some drugs for compelling indications. Assuming the total cost of an ACE inhibitor and a diuretic is Rs 12/ day, it would cost 0.6 billion rupees per day for 0.5 billion population. For 365 days, i.e. one year the cost would be approximately 219 billion rupees. (Table 1)

Lifestyle Measures

JNC 7 advocates adoption of healthy lifestyles by all persons as an essential requirement for the prevention of high BP. It is an indispensable part of the management of those with hypertension (4). Lifestyle modifications

reduce BP, prevent or delay the incidence of hypertension, enhance antihypertensive drug efficacy, and decrease cardiovascular risk. Subjects with blood pressure in prehypertensive range are particularly advised lifestyle measures for control of future progression of risk. Healthy lifestyle measures include weight reduction, DASH eating plan, dietary sodium restriction, exercise, total abstinence from tobacco, and alcohol in moderation. The approximate cost of healthy lifestyle is calculated in Table 2.

Caveat

Having said that increasing blood pressure plays a significant role in cardiovascular morbidity and mortality, one must restrain from over stretching the dangers of prehypertension lest the comprehensive evaluation has shown evidence of target organ damage. The

Table 1: Cost analysis of economic burden of hypertension in India

Total population affected with Hypertension	Total Economical burden/year for treatment of entire affected population (Rs billion)@	Total Economical burden/year if Lifestyle measures are adopted by entire affected population (Rs billion)	Net Saving if Lifestyle measures are adopted for prevention rather than treatment of CVDs (Rs billion)
200 million	876	511	365

@ based on the assumption that a combination of diuretic and ACE inhibitor will cost approximately Rs 12/day to a patient.

Table 2: Estimated Expenditure on Healthy Lifestyle

Lifestyle Measure	Expenditure
Eating Two Vegetables/ day (Lockey, Karela)	Rs 5/ day
Eating Two Fresh fruits (Orange, Jamun)	Rs 5/ day
Walking	Nil
Yoga	Nil
Stop Smoking	- Rs 3/day* (Saving)
Total/person/day	Rs 7/ day
Total/person/year	Rs. 2555/person/year

* Presuming one bundle of bidi costs Rs 3.

purpose of the treatment is to reduce the risk of CAD and stroke, not merely the level of blood pressure. Soothing the nerves of an alarmed young man having blood pressure in prehypertensive range is crucial because such a raised blood

pressure can be reversed with lifestyle measures. Recourse to definitive drug therapy should only be undertaken once the rigorous lifestyle measures have failed in controlling the blood pressure after a period of six months to a year.

References

- Gupta R (2004). Trends in hypertension epidemiology in India. *J Hum Hypertens* **18**: 73-78.
- Kannel WB, McGee D, Gordon T (1976). A general cardiovascular risk profile: the Framingham Study. *Am J Cardiol* **38**:46-51.
- Cohen G, Vella S, Jeffery H, Lagercrantz H, Katz-Salamon M (2008). Cardiovascular stress hyperreactivity in babies of smokers and in babies born preterm. *Circulation* **118**:1848-53.
- Chobanian AV, Bakris GL, Black HR (2003). The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure- The JNC 7 report. *JAMA* **289**:2560-2572.
- Dwivedi S Aggarwal R (2009). Economical implications of Preventive Cardiology: Indian

- Perspective. *Annals of Natl Acad Med Sciences (India)* **45**: 97-116.
6. Fox KM (2003). EUROpean trial on reduction of cardiac events with Perindopril in stable coronary artery disease Investigators. Efficacy of perindopril in reduction of cardiovascular events among patients with stable coronary artery disease: randomized, double blind, placebo controlled, multi-centre trial (the EUROPA study). *Lancet* **362**:782-88.
 7. Vasan RS, Larson MG, Leip EP, Kannel WB, Levy D (2002). Assessment of frequency of progression to hypertension in non-hypertensive participants in the Framingham heart study: a cohort study. *JAMA* **287**:1003-1010
 8. Thankappan KR, Sivasankaran S, Khader SA, Sarma PS, Mini GK, Vasan RS (2006). Prevalence, correlates, awareness, treatment and control of hypertension in Kumarakom, Kerala: baseline results of a community based intervention program. *Indian Heart J* **58**: 28-33.
 9. Sharma AK, Bhardwaj S, Chaturvedi S (2006). Predictors of hypertension in an urban Indian population. *Indian Heart J* **58**: 21-27.
 10. Gupta R (1997). Meta-analysis of prevalence of hypertension in India. *Indian Heart J* **49**: 337-38.
 11. Dwivedi S, Avasthi N (1999). Familial aggregation of risk factors-an illustrative pedigree. *South Asian Journal of Preventive Cardiology* **3**: 108-111.
 12. Das SK, Sanyal K, Basu A (2005). Study of urban community survey in India: growing trend of high prevalence of hypertension in a developing country. *Int J Med Sci* **2**:70-78.
 13. Chockalingam A, Ganesan N, Venkatesan S, et al (2005). Patterns and predictors of prehypertension among "healthy" urban adults in India. *Angiology* **56**:557-63.
 14. Gupta R, Gupta V (1996). Meta analysis of coronary heart disease prevalence in India. *Indian Heart Journal* **48**:241-245
 15. Viswanathan V, Snehalatha C, Kumutha R, Nair BM, Ramachandran A (2004). Impact of Joint National Committee VII recommendations on diabetic microvascular complications. *J Assoc Physicians India* **52**:873-6.

16. Sathiyapriya V, Selvaraj N, Nandeesh H, Bobby Z, Aparna A, Pavithran P (2008). Association between protein bound sialic acid and high sensitivity C-reactive protein in prehypertension: a possible indication of underlying cardiovascular risk. *Clin Exp Hypertens* **30**:367-74.
17. Sathiyapriya V, Nandeesh H, Bobby Z, Pavithran P, Selvaraj N, Rattina Dasse N (2006). Insulin resistance and enhanced protein glycation in men with prehypertension. *Clin Chem Lab Med* **44**:1457-61.
18. Venkatesh P, Gadia R, Tewari HK, Kumar D, Garg S (2006). Prehypertension may be common in patients with central serous chorioretinopathy. *Graefes Arch Clin Exp Ophthalmol* **244**:1101-3.