

## Is prehypertension a disease?

Prehypertension is an important public health problem all over the globe as it is the precursor of hypertension, and it is known to be associated with many adverse outcomes.<sup>[1]</sup> It has been observed that the conversion rate of prehypertension to hypertension over a period of 4 years is about 30%.<sup>[2]</sup> Prehypertension has also been reported to be associated with an increased risk of major cardiovascular (CV) disease events.<sup>[2]</sup> The San Antonio Heart Study demonstrated that blood pressure (BP) in prehypertension range is associated with diabetes mellitus.<sup>[3]</sup> The prevalence of prehypertension and its associated risk factors have been investigated worldwide since the publication of Joint National Committee (JNC-7) report on BP in 2003.<sup>[4]</sup> Many studies have focused on the predictors of progression from prehypertension to hypertension. It has been emphasized that appropriate treatments should be given to the prehypertensive group in different degree to effectively reduce their CV and other disease risks.

The concept of prehypertension came into limelight when in 1939 Robinson and Brucer reported that the range of BP between 120–139 mmHg (systolic) and 80–89 mmHg (diastolic) as being of value in determining clinically overt hypertension. Almost three decades later, the same BP range was referred to as “borderline hypertension,” which later changed to as “high-normal BP” in 1997. The name “prehypertension” was given in 2003 by JNC-7 that categorized BP levels between 130–139 and 80–89 mmHg.<sup>[4]</sup> A survey on prehypertension and hypertension conducted by the National Health and Nutrition forum, which was designated as The National Health and Nutrition Examination Survey, in 1999–2000 reported that the overall prevalence of prehypertension throughout the world is 31%, and the incidence is higher in men compared to that of women.<sup>[5]</sup>

Prehypertension is associated with the established CV risk factors, and all the risk factors for hypertension such as obesity, insulin resistance, diabetes, and dyslipidemia.<sup>[6]</sup> Furthermore, it was reported that 90% of individuals with prehypertension have at least one CV risk factor. Though prehypertension was not detected earlier in patients those who presented with stroke; on retrospective analysis, it was found that prehypertension was an important risk factor for in them.<sup>[7]</sup> In India, subjects with prehypertension and hypertension were older, had a higher body mass index (BMI), central obesity, and a sedentary lifestyle.<sup>[8]</sup> They had a higher salt and alcohol intake, and in women with greater oral contraceptive

usage. It has been observed that the prehypertensives have higher levels of fasting blood glucose and insulin, dyslipidemia, excess adiposity in the form of increased BMI, and lower levels of high-density lipoprotein cholesterol compared to that of normotensives.<sup>[9]</sup> Obesity, hyperinsulinemia, insulin resistance, and elevated fasting blood glucose were frequently associated with prehypertension and hypertension.<sup>[10]</sup> Cardiometabolic syndrome, a cluster of several risk factors such as abdominal obesity, dyslipidemia, and prediabetes is associated with prehypertension.<sup>[11]</sup> Among all the risk factors, BMI was found to be a strong predictor of prehypertension and BMI >23 kg/m<sup>2</sup> was observed to be the major determinant of prehypertension. Furthermore, prehypertensives had higher levels of C-reactive protein, tumor necrosis factor-alpha, amyloid-a, and homocysteine after adjusting for confounders such as age, gender, BMI, smoking, alcohol intake, serum lipids, and plasma glucose.<sup>[12]</sup> Incidence of microalbuminuria was more in the prehypertensives than in normotensives, and prehypertension was associated with higher serum gamma-glutamyl transferase levels.<sup>[13]</sup>

Especially, in developing countries in Asia, due to abrupt change in economic and social environments, increase in alcohol intake and smoking, decreased physical activity, psychosocial stress due to competitions and family separations, increased incidence of diabetes mellitus and obesity and adaptation to fast and junk food rich in fat and salt have all contributed to rapid increase in the incidence of prehypertension and hypertension. Prehypertension, even in the lower range, increases the risk of CV diseases after adjusting for multiple confounding factors.<sup>[14]</sup> Recently, prehypertension has attracted the attention of physicians and researchers for its deleterious impacts on myocardial structure and function.<sup>[15]</sup> Left ventricular functions were found to be significantly abnormal in prehypertensive group compared to the normal BP group, after adjusting for confounders such as age, gender, BMI, smoking status, and plasma glucose level. It was reported that prehypertension is associated with an increased risk of acute myocardial infarction and coronary artery disease (CAD), as estimated in a 10-year follow-up study.<sup>[16]</sup> Prehypertensive and hypertensive patients with ventricular hypertrophy are at increased risk of developing CAD, stroke, heart failure, and sudden death, and antihypertensive therapy that decreases the degree of ventricular hypertrophy reduces the risk of adverse CV events in these patients.<sup>[17]</sup>

Prehypertension is a global major health risk that subjects individuals to the risk of CV disease independent of progression to overt hypertension. Prehypertension is a major health challenge that requires extra attention. The challenge exists in finding the answer to how or what should be the intervention strategies that may reduce its adverse health impacts. The CV events and other morbidities associated with prehypertension must be well-defined and communicated to professionals involved in health care management. The first step would be to declare prehypertension as a disease to create awareness of the morbidities and mortalities associated it. Then, the first-line of treatment for prehypertensives should be to adopt a healthy lifestyle, especially if it is associated with the risk factors such as obesity, dyslipidemia, prediabetes or diabetes, excessive alcohol intake, sedentary lifestyle, smoking, and excess salt intake. It is desirable that a standard operating procedure is adopted and implemented by government and the policy makers, which should be directed in a way similar to that of vigorous antismoking campaign, towards changing the community behavior of such a lifestyle disorder. More seminars, symposia, CMEs, and conferences should be organized regularly to create awareness among public and health professionals and to highlight the pathophysiology and management of adverse health impacts of prehypertension.

### G K Pal

Professor, Department of Physiology, Faculty-in-Charge, Advance Yoga Center, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India

#### Address for correspondence:

Prof. G K Pal,  
Department of Physiology, Faculty-in-Charge,  
Advance Yoga Center, Jawaharlal Institute of Postgraduate  
Medical Education and Research, Puducherry, India.  
E-mail: drgkpal@gmail.com

## REFERENCES

1. Albarwani S, Al-Siyabi S, Tanira MO. Prehypertension: Underlying pathology and therapeutic options. *World J Cardiol* 2014;6:728-43.
2. Guo X, Zou L, Zhang X, Li J, Zheng L, Sun Z, *et al.* Prehypertension: A meta-analysis of the epidemiology, risk factors, and predictors of progression. *Tex Heart Inst J* 2011;38:643-52.
3. Mullican DR, Lorenzo C, Haffner SM. Is prehypertension a risk factor for the development of type 2 diabetes? *Diabetes Care* 2009;32:1870-2.
4. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr., *et al.* Seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. *Hypertension* 2003;42:1206-52.
5. Wang Y, Wang QJ. The prevalence of prehypertension and

- hypertension among US adults according to the new joint national committee guidelines: New challenges of the old problem. *Arch Intern Med* 2004;164:2126-34.
6. Zhang W, Li N. Prevalence, risk factors, and management of prehypertension. *Int J Hypertens* 2011;2011:605359.
7. Greenlund KJ, Croft JB, Mensah GA. Prevalence of heart disease and stroke risk factors in persons with prehypertension in the United States, 1999-2000. *Arch Intern Med* 2004;164:2113-8.
8. Yadav S, Boddula R, Genitta G, Bhatia V, Bansal B, Kongara S, *et al.* Prevalence and risk factors of pre-hypertension and hypertension in an affluent North Indian population. *Indian J Med Res* 2008;128:712-20.
9. Isezuo SA, Sabir AA, Ohwovorilole AE, Fasanmade OA. Prevalence, associated factors and relationship between prehypertension and hypertension: A study of two ethnic African populations in Northern Nigeria. *J Hum Hypertens* 2011;25:224-30.
10. Cordero A, Laclaustra M, León M, Grima A, Casanovas JA, Luengo E, *et al.* Prehypertension is associated with insulin resistance state and not with an initial renal function impairment. A Metabolic Syndrome in Active Subjects in Spain (MESYAS) Registry substudy. *Am J Hypertens* 2006;19:189-96.
11. Duprez D, Toleuova A. Prehypertension and the cardiometabolic syndrome: Pathological and clinical consequences. *Expert Rev Cardiovasc Ther* 2013;11:1725-33.
12. Zhang Y, Lee ET, Devereux RB, Yeh J, Best LG, Fabsitz RR, *et al.* Prehypertension, diabetes, and cardiovascular disease risk in a population-based sample: The Strong Heart Study. *Hypertension* 2006;47:410-4.
13. Kim BJ, Lee HJ, Sung KC, Kim BS, Kang JH, Lee MH, *et al.* Comparison of microalbuminuria in 2 blood pressure categories of prehypertensive subjects. *Circ J* 2007;71:1283-7.
14. Huang Y, Wang S, Cai X, Mai W, Hu Y, Tang H, *et al.* Prehypertension and incidence of cardiovascular disease: A meta-analysis. *BMC Med* 2013;11:177.
15. Marilyn B, Lawrence W, Richard B. Association of prehypertension by joint national committee 7 criteria with left ventricular structure and function: The strong heart study. *J Am Coll Cardiol* 2004;17:1142-83.
16. Huang Y, Su L, Cai X, Mai W, Wang S, Hu Y, *et al.* Association of all-cause and cardiovascular mortality with prehypertension: A meta-analysis. *Am Heart J* 2014;167:160-8.e1.
17. He DH, Zhang LM, Lin LM, Ning RB, Wang HJ, Xu CS, *et al.* Long-term prehypertension treatment with losartan effectively prevents brain damage and stroke in stroke-prone spontaneously hypertensive rats. *Int J Mol Med* 2014;33:301-9.

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