

## How Normal Is Normal Blood Pressure?

*Kshirsagar AV, Carpenter M, Bang H, et al. Blood pressure usually considered normal is associated with an elevated risk of cardiovascular disease. Am J Med 2006;119:133–41.*

### Study Overview

**Objective.** To describe the risk of cardiovascular disease (CVD) among persons with prehypertension (blood pressure [BP] between 120/80 mm Hg and 139/89 mm Hg).

**Design.** Prospective cohort study.

**Setting and participants.** 8960 participants aged 45 to 64 years were recruited from a 4 geographically diverse communities in the United States and enrolled in the Atherosclerosis Risk in Communities (ARIC) study. The following subgroups were analyzed: blacks, persons aged 55 to 64 years, persons with diabetes mellitus, persons with renal insufficiency, and individuals with varying levels of low-density lipoprotein (LDL) cholesterol or body mass index (BMI). Optimal BP was defined as systolic BP of < 120 mm Hg and diastolic BP of < 80 mm Hg, normal BP was defined as systolic BP of 120 to 129 mm Hg or diastolic BP of 80 to 84 mm Hg, and high-normal BP was defined as systolic BP of 130 to 139 mm Hg or diastolic BP of 85 to 89 mm Hg.

**Main outcome measure.** Incident CVD (mean follow-up, 11.6 years). CVD was defined as fatal/nonfatal coronary heart disease, cardiac procedure, silent myocardial infarction, or ischemic stroke.

**Main results.** Compared with optimal BP, high-normal BP and normal BP were associated with an increased risk of CVD (relative risk [RR], 2.33 [95% confidence interval {CI}, 1.85–2.92] and RR, 1.81 [95% CI, 1.47–2.22], respectively). For high-normal BP, the RR was 3.29 (95% CI, 1.68–6.45) among blacks, 4.10 (95% CI, 2.26–7.46) among those with diabetes, 2.41 (95% CI, 1.75–3.30) for those aged 55 to 64 years, 1.90 (95% CI, 1.34–2.70) among individuals with renal insufficiency, 3.56 (95% CI, 1.99–6.35) among those with BMI > 30 kg/m<sup>2</sup>, and 1.85 (95% CI, 1.26–2.72) in those with an LDL cholesterol level > 160 mg/dL.

**Conclusion.** Individuals with BP levels considered to be prehypertensive are at increased risk of developing CVD as compared with individuals with optimal BP levels. Blacks, individuals with diabetes, and those with high BMI mea-

surements are especially affected.

### Commentary

More than 50 million people in the United States currently have hypertension [1]. Until recently, evidence-based guidelines have recommended targeting patients with BP 140/90 mm Hg or higher for therapeutic intervention to reduce CVD risk [2]. In 2003, the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) introduced prehypertension, a new category of blood pressure, and recommended that individuals with systolic BP of 120 to 139 mm Hg or diastolic BP of 80 to 89 mm Hg be closely followed [3]. Few studies have examined the adverse outcomes of BP in this previously “normal” range.

Kshirsagar et al found that high-normal BP and normal BP were associated with an increased risk of new CVD (133% and 69%, respectively). The researchers adjusted for well-known potential confounders that may contribute to CVD, including cholesterol level, diabetes, and age. However, this study does have a significant limitation. The researchers were unable to determine if the elevated CVD risk was attributable only to increases in BP. Small increases in BP are associated with significant hemodynamic and metabolic abnormalities that are, themselves, independent risk factors for CVD. Thus, this small BP elevation can cause an additive or multiplicative risk when taken in consideration with these other metabolic changes.

### Applications for Clinical Practice

Prehypertension levels of BP are associated with increased risk for CVD, especially in certain high-risk groups (ie, blacks, diabetics, patients with elevated BMI). Clinicians should consider aggressive behavioral modification and treatment to lower BP to ideal levels in these high-risk groups.

—Review by Christianne L. Roumie, MD, MPH

### References

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3. Chobanian AV, Bakris GL, Black HR, et al. The Seventh

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