

Epidemiology of Hypertension and Cardiovascular Disease in African Americans

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Hypertension is a major cause of cardiovascular-renal morbidity and mortality and all-cause mortality. It is a highly significant problem for African Americans; about 30% of all deaths in this population are attributable to hypertension. Compared with whites, hypertension in African Americans is more prevalent, occurs earlier in life, is more severe, and is more often associated with target organ injury such as left ventricular hypertrophy and other cardiovascular complications. Only 25% of all African Americans with hypertension and fewer than 50% of those receiving drug treatment attain a blood pressure <140/90 mm Hg. These control rates are somewhat less than in white Americans. Enhanced awareness and understanding of the epidemiologic patterns of hypertension, other cardiovascular risk factors, risk-factor control rates, and factors influencing these control rates should lead to better approaches to risk-factor control. This most likely would result in a reduction of cardiovascular disease complications. (J Clin Hypertens. 2003;5(1 suppl 1):5-11)

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Hypertension is a major public health and clinical condition affecting an estimated 50 million Americans; approximately 2 million people

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are diagnosed with hypertension every year. The prevalence of hypertension in African Americans is among the highest of any racial/ethnic group in the world¹; an estimated 5.6 million have hypertension.² Compared to whites, hypertension in blacks is more prevalent, more severe, has an onset earlier in life, and is linked to a higher burden of target organ injury.¹ Accordingly, this population has a greater burden of hypertension-related diseases—stroke, coronary heart disease (CHD), heart failure, and renal dysfunction—than the general population.

At the group level, quantitative, not qualitative, differences in the physiologic characteristics of hypertension have been documented between blacks and whites. Most notably, these include higher peripheral vascular resistance, greater salt sensitivity, and lower circulating renin levels.³⁻⁶ These physiologic tendencies have not been linked to differences in clinical outcomes, for example, in hypertension end-point trials. For example, circulating renin levels do not predict the blood pressure response to treatment with angiotensin-converting enzyme (ACE) inhibitors and are not linked to the effectiveness of agents that block the renin-angiotensin system in preventing microvascular or macrovascular complications.

This report reviews the epidemiology of hypertension and other cardiovascular disease (CVD) risk factors in African Americans and describes the adverse consequences associated with elevated blood pressure, both alone and in combination with other CVD risk factors.

EPIDEMIOLOGY

Risk Factors

There are a number of proven risk factors for the development of CVD, including hypertension, dyslipidemia, diabetes, physical inactivity, cigarette smoking, and obesity. The predictive value of these

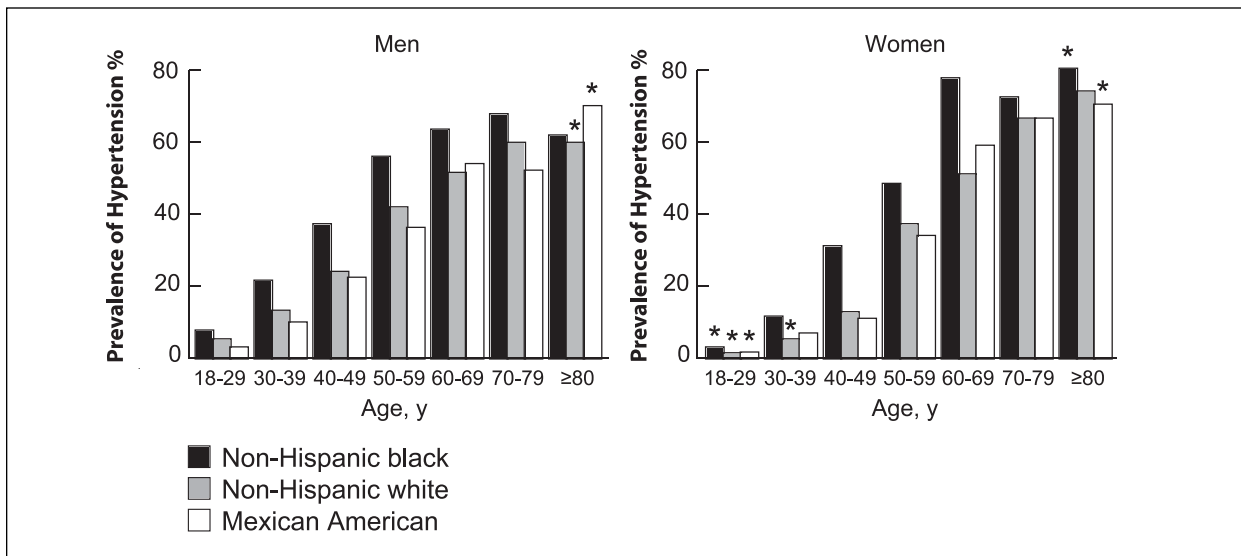


Figure 1. Prevalence of high blood pressure by age and race/ethnicity for men and women
 *Estimate based on sample size not meeting minimum requirements of the Third National Health and Nutrition Evaluation (NHANES III) design or relative SEM >30%.
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conventional risk factors for different racial groups is similar after recalibration for differing prevalences of risk factors and underlying rates of CHD events.⁷

Prevalence of Hypertension

A concerted effort over many years has improved the detection, evaluation, and treatment of hypertension and subsequently has produced a substantial reduction in the prevalence of elevated blood pressure levels among all racial groups.⁸ Results from the Third National Health and Nutrition Examination Survey (NHANES III)² found that African American men and women have higher crude and age-adjusted prevalences of hypertension than whites and Mexican Americans.² Crude prevalence rates were 29.9% and 27.3%, respectively, for African American men and women compared with 25.6% and 23.8% for non-Hispanic white men and women and 14.6% and 14.0% for Mexican American men and women.² The overall age-adjusted prevalence of hypertension for African Americans is 32.4% (34.0% men, 31.0% women).²

When stratified by age, African Americans have a greater prevalence of hypertension than non-Hispanic whites or Mexican Americans in all but the oldest age range for men (Figure 1).² In most age and race groups, men have a higher age-specific rate of hypertension than women. However, among older populations (60 years or older for African Americans and Mexican Americans and 70 years or older for whites), women have a higher prevalence of hypertension than men. African Americans not only have a higher prevalence

of hypertension but also have more severe hypertension. In NHANES III, these individuals had higher prevalence of stage 3 hypertension (>180/110 mm Hg) than whites (≈8.5% vs. <1%).¹ Similar findings were observed in the Hypertension Detection and Follow-up Program (HDFP),^{5,9} in which the prevalence of severe hypertension (defined as diastolic blood pressure [DBP] ≥115 mm Hg) was five- to seven-fold more prevalent in African Americans than in whites.

Awareness of hypertension is high in non-Hispanic blacks and similar to other racial groups. Treatment and control of hypertension in African Americans as well as in whites and especially Mexican Americans is suboptimal. Inadequate blood pressure control in this group contributes significantly to the burden of pressure-related target organ damage such as left ventricular hypertrophy and chronic kidney disease. Figure 2 summarizes the extent of treatment and control of hypertension among various racial/ethnic groups as reported in NHANES III. In this survey, 74% of non-Hispanic blacks and about 70% of non-Hispanic whites with hypertension were aware of their condition.² Awareness is higher among African American women (79%) than African American men (69%), with a trend toward increased awareness with increased age.² In a logistic regression analysis, non-Hispanic African Americans are at increased risk of not being aware of the presence of hypertension.¹⁰ Hypertension is also substantially undertreated and undercontrolled. Only 57% of African Americans and 53% of white patients with hypertension receive treatment; only 25% and 24%, respectively, have their hypertension controlled (<140/90 mm Hg).^{5,10} When

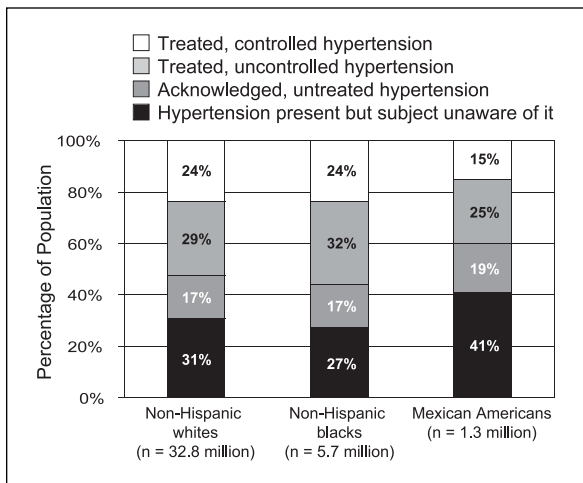


Figure 2. Extent of awareness, treatment, and control of hypertension among non-Hispanic whites, non-Hispanic African Americans, and Mexican Americans with hypertension in the Third National Health and Nutrition Evaluation (NHANES III). Reprinted with permission from N Engl J Med. 2001;345:479-486.¹⁰

this analysis is restricted only to those taking drug therapy, fewer than 50% of African American men and women in the United States have achieved blood pressure control levels of <140/90 mm Hg.

NHANES III also reported that the mean systolic blood pressure (SBP) and DBP of all African Americans was 125 and 75 mm Hg, respectively.² These blood pressure levels are slightly higher than those for the US population as a whole (122 and 74 mm Hg) and for whites (122 and 74 mm Hg). Figure 3 shows the mean SBP and DBP for African Americans according to treatment status. On average, the SBP and DBP of untreated African Americans with hypertension was 30 and 20 mm Hg higher, respectively, than for normotensive African Americans.² These differences are greater than those for whites, where differences in SBP and DBP of 23 and 15 mm Hg, respectively, between untreated hypertensive and normotensive patients were observed. As noted, treatment of hypertension, in different racial groups, does not typically result in normotensive blood pressure levels or cardiovascular risk reduction.

Prevalence of Other Cardiovascular Risk Factors

In addition to an increased prevalence of hypertension, African Americans have a higher prevalence of additional CVD risk factors compared to whites of comparable socioeconomic status.^{8,11} For example, in NHANES II, these individuals were 1.5 times more likely than their white counterparts to have multiple risk factors for CVD (Figure 4).^{5,11} This interaction of multiple risk factors synergistically increases the risk of CVD.¹²

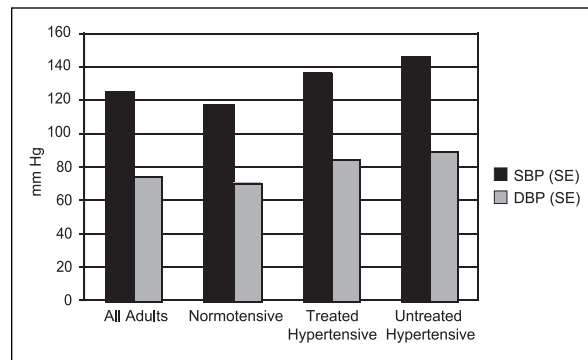


Figure 3. Mean systolic and diastolic blood pressure (SBP/DBP) for African Americans according to baseline blood pressure and treatment status. Data derived from Hypertension. 1995;25:305-311.²

DIABETES

Diabetes mellitus is the sixth leading cause of death in the United States (69,000 deaths during 2000) and accounts for almost 24 million physician office visits annually.¹³ An estimated 17 million Americans have diabetes mellitus; the proportion of people diagnosed with diabetes has increased 49% over the past decade and is expected to continue to increase.¹⁴ Diabetes mellitus is especially prevalent among African Americans; it is estimated that 2.3 million have diabetes mellitus, although only 1.5 million are actually aware of their condition. Among patients 40-74 years old, the prevalence of diabetes is 11.2% for whites, 18.2% for African Americans, and 20.3% for Mexican Americans. Mortality rates attributable to diabetes mellitus are also higher in other racial groups than in whites; the rates per 100,000 are 28.4 for African American men, 23.4 for white men, 39.1 for African American women, and 25.7 for white women.¹³

Obesity is a major risk factor for diabetes mellitus; traditional CVD risk factors are more commonly encountered in persons with diabetes mellitus than nondiabetic persons. For example, 71% of all patients

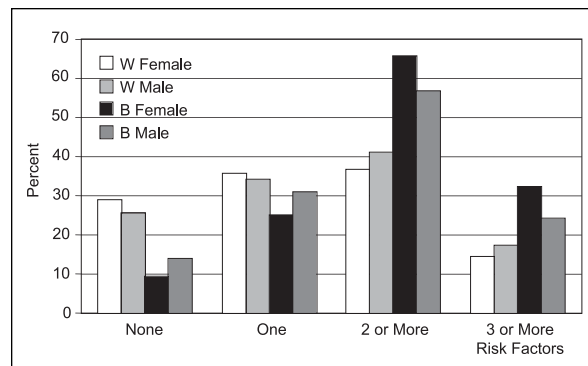


Figure 4. Risk-factor clustering according to race and sex. Reprinted with permission from Heart Disease. 2001;3:97-108.¹²

with diabetes mellitus have hypertension (SBP $\geq 130/85$ mm Hg or are taking antihypertensive medication). African Americans with diabetes have higher prevalence rates of hypertension (75.4%) than either whites (70.7%) or Mexican Americans (64.5%). Interestingly, awareness, treatment, and control rates of hypertension in patients with diabetes are higher in African Americans than any other racial groups. Only 12% of all patients with diabetes mellitus and hypertension, but 14% of African Americans, attain blood pressure control levels to the goal of $<130/85$ mm Hg recommended by the Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VI).¹⁵

Importantly, the long-term secular trend of lower heart disease in the overall US population has been less favorable among men with diabetes and has actually increased among diabetic women; however, heart disease death rates seem to have slightly increased in nondiabetic men as opposed to the decline seen in nondiabetic women.¹⁶

DYSLIPIDEMIA

Elevated serum cholesterol levels are an important modifiable risk factor for CHD, and treating hypercholesterolemia lowers the risk of developing disease.^{17,18} Several studies have reported that African Americans have lower total low-density lipoprotein (LDL) cholesterol concentrations and a lower prevalence of hypercholesterolemia.¹² However, the Coronary Artery Risk Development in Young Adults (CARDIA)¹⁹ study found that the prevalence of LDL cholesterol levels ≥ 160 mg/dL was 10% and 5%, respectively, in young adult African American men and women compared with 9% for white men and 4% for white women. African Americans generally have higher levels of high-density lipoprotein (HDL) cholesterol than whites, particularly among men.¹¹ Neither the slightly lower LDL cholesterol levels nor slightly higher HDL levels confer enough "protection" to prevent CHD death rates for this population group from being among the highest in the world.²⁰ Furthermore, according to Prisant et al.,²¹ fewer African Americans (26%) than whites (47%) are actually aware of their hypercholesterolemia.

OBESITY

The entire US population, including children and adults, is becoming increasingly obese. The contemporary definition for overweight is a body mass index of 25–29.99 kg/m²; a body mass index ≥ 30 kg/m² is defined as obese. The prevalence of obesity in the US population doubled from 13% to 27% between 1960 and 1999.^{13,22} Furthermore, the prevalence of obesity and overweight is higher in African Americans than in

whites at every educational level in NHANES III, with the highest rates occurring in the lowest socioeconomic strata.²³ The lack of physical activity is almost assuredly related to the increasing rates of obesity and excess weight. Cross-sectional data indicate that about 22% of US adults participate in no leisure-time physical activity, with women less active than men (27% vs. 17%, respectively).²⁴ Forty percent of African American women are physically inactive, and this group has the greatest age-related decrease in the cross-sectional prevalence of physical activity. Data from the CARDIA²⁵ study showed that these women had a 2.7 kg/m² higher age-adjusted mean body mass index, higher total energy intake, lower levels of physical activity, and lower physical fitness than white women.

COMPLICATIONS OF HYPERTENSION

Hypertension-induced target organ damage and mortality are higher in African Americans than whites.²⁶ For example, there is an increased risk of many complications, including heart disease death (1.5-fold), heart failure (1.7-fold), nonfatal stroke (1.3-fold), fatal stroke (1.8-fold), and end-stage renal disease (ESRD) (4.2-fold).⁸

CARDIOVASCULAR DISEASE

CVD is the leading cause of death among African Americans and produces more excess mortality than any other cause.²⁰ Hypertension is an important antecedent cause of CVD in this population. In the Meharry-Hopkins physician cohort study,²⁷ predictors of CVD were analyzed in black and white physicians. Hypertension was the best predictor of cardiac events in black physicians, whereas smoking, cholesterol, and a family history of CHD were better predictors of cardiac events in white physicians.²⁷ Up to 30% of all deaths in hypertensive men and 20% of deaths in hypertensive African American women are due to hypertension.⁸ Hypertension-related mortality seems to be substantially greater for African Americans than for other populations. For instance, the overall death rate (per 100,000 population) from high blood pressure in 1999 was estimated to be almost four-fold higher in black men than in their white counterparts (46.8 vs. 12.8).⁸ For women, hypertension-related death rates (per 100,000 population) were 40.3 for African Americans and 12.8 for whites.⁸

The prevalence of CHD is greater in African Americans than in whites, with prevalences of 7.1% and 9.0%, respectively, for African American men and women compared with 6.9% and 5.4%, respectively, for white men and women.⁸ On average, CHD develops approximately 5 years earlier and has a higher mortality rate in individuals of the same age.¹¹ CHD death rates (per 100,000 population) are

272 and 193, respectively, for African American men and women compared with 249 and 153, respectively, for white men and women.⁸ Death rates attributable to heart disease in African Americans are in fact among the highest in the world.²⁰ Coronary heart disease mortality has declined over the last 20 years; however, the rate of decline for African Americans has been less than that experienced by whites.²⁸

Stroke ranks as the third leading cause of death in the United States. Although stroke mortality has steadily declined for several decades, death rates from stroke remain higher in African Americans than in whites. Despite the growth and aging of the US population, the stroke death rate decreased 13% from 1989 to 1999; however, the actual number of stroke deaths increased 8.6%.⁸ The 1999 death rates per 100,000 for stroke were 87.4 for African American men, 60 for white men, 78.1 for African American women, and 58.7 for white women; there is a 38% greater risk of incident stroke than in whites.⁸ Compared with whites, young African Americans have two to three times the risk of ischemic stroke, and men in this racial group are more likely to die of stroke. Within this younger population subgroup, the relative risk of stroke death is 4 times higher in non-Hispanic African Americans than in the U.S. non-Hispanic white population. Most of the excess burden of stroke mortality in African Americans is observed at younger ages (35–54 years). There is a consistent pattern of geographic variation in stroke mortality, with higher rates in the southeastern portion of the United States (the “stroke belt”) than other regions.²⁹

The reasons for the high rates of cardiovascular complications in African Americans are unknown; however, a number of theories have been suggested.³⁰ One likely explanation for at least part of the increased prevalence of complications is the longer duration and greater severity of hypertension in these individuals than in whites. African Americans also have a greater 24-hour blood pressure burden at a given level of causal blood pressure than white patients.³⁰ Economic and social factors may also play a role. In addition, the excessively high prevalence of coexisting CVD risk factors such as diabetes mellitus, cigarette smoking, obesity, and physical inactivity, together with the high burden of elevated blood pressure, cause inordinately high rates of CVD. Also, African American patients tend to have less access to cardiovascular care and are treated less aggressively than white patients.¹²

Another factor may be the higher prevalence of left ventricular hypertrophy in African Americans than in whites. Left ventricular mass is correlated with elevated SBP and is an independent predictor of coronary events.³¹ In the CARDIA study,³² SBP was an independent predictor (and stronger correlate

than DBP) of left ventricular mass and the ventricular wall thickness/chamber radius ratio. Notably, these parameters were greater in African Americans than in whites after adjustment for all covariates. Obesity was an even stronger predictor of left ventricular mass than SBP in the mostly normotensive CARDIA study cohort.³²

Renal Disease

Because kidney disease is one of the leading causes of death in the United States, the importance of discerning the etiologies of this pervasive condition is obvious.¹³ Hypertension is an established risk factor for the development of chronic renal insufficiency as well as ESRD.³³ Hypertension and chronic renal disease are closely related. Approximately 80% of patients in whom renal insufficiency progresses to ESRD are hypertensive during the course of their disease.³⁴ In an analysis of data from the Multiple Risk Factor Intervention Trial (MRFIT),^{35,36} elevated blood pressure and low socioeconomic status were associated with a higher incidence of ESRD and renal disease mortality. ESRD is more prevalent in racial and ethnic minorities such as African Americans and Native Americans.^{35,37} In MRFIT, the overall relative risk of ESRD in African American men was 3.2 compared to whites. However, this excess risk was reduced to 1.87 after adjustment for baseline age, SBP, cigarette smoking, prior myocardial infarction, diabetes, income, and serum cholesterol levels.³⁵ Thus, a significant proportion of the excess risk of ESRD in these men relative to whites in MRFIT was attributable to conventional cardiovascular risk factors. With nearly 6% of the population diagnosed as diabetic, diabetes mellitus is the leading cause of ESRD, accounting for 35% of the new cases each year in the United States. Hypertension is the second leading cause of chronic renal failure, accounting for about 25% of new ESRD cases in the United States.³⁸ According to annual reports of the US Renal Data System, the adjusted incidence of ESRD is three- to four-fold greater in African Americans and Native Americans than in whites. Recent data suggest a strong link between even modest levels of renal insufficiency and the risk for myocardial infarction and premature postinfarct mortality.^{39,40}

Reasons for the increased risk of ESRD in African Americans are unclear. Although the prevalence of hypertension is higher in African Americans, this does not entirely account for the differing rates of ESRD.^{35,37} The higher prevalence of salt-sensitive hypertension in this population may also be a factor by producing alterations in intrarenal hemodynamics (increased glomerular pressure, increased filtration fraction, and microalbuminuria) after salt loading.³⁰ African Americans with diabetes also seem to have a

lower functional renal reserve than whites.⁴¹ The differences seem to be related to a defect in the production or bioavailability of nitric oxide.⁴¹ Other postulated reasons include inadequate control of hypertension and the lack of use of renoprotective antihypertensive agents such as angiotensin-converting enzyme inhibitors.³⁷ Another possible cause relates to the excess obesity in African Americans, particularly in women, given the well-described deleterious effects of obesity on kidney function.⁴² Finally, the excess prevalence of cigarette smoking in this population might also contribute to the excess kidney disease, given the recent linkage of cigarette smoking to abnormalities in kidney function.⁴³

CONCLUSIONS

The prevalence of hypertension in African Americans is among the highest in the world; compared to whites, hypertension develops earlier in life and average blood pressures are higher. African Americans have higher rates of JNC VI stage 3 hypertension than whites, causing a greater burden of hypertension complications. In addition to a higher prevalence of hypertension, African Americans also have a higher prevalence of other cardiovascular risk factors such as diabetes, cigarette smoking, physical inactivity (mostly women), and obesity. Not unexpectedly, the higher prevalences of these risk factors translate into a higher prevalence of target organ damage, increased risks of death due to heart disease, heart failure, fatal and nonfatal stroke, chronic kidney disease, and ESRD. CVD also tends to occur earlier and is associated with a higher mortality than for whites of a similar age. An understanding of the epidemiology of hypertension and other risk factors among African Americans can aid in the development and implementation of effective management strategies to prevent these complications.

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