Published in final edited form as:
Am J Med Sci. 2014 August ; 348(2): 135–138. doi:10.1097/MAJ.0000000000000308.

Racial Differences in Hypertension: Implications for High Blood Pressure Management

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Abstract

The racial disparity in hypertension and hypertension-related outcomes has been recognized for decades with African Americans with greater risks than Caucasians. Blood pressure levels have consistently been higher for African Americans with an earlier onset of hypertension. While awareness and treatment levels of high blood pressure have been similar, racial differences in control rates are evident. The higher blood pressure levels for African Americans are associated with higher rates of stroke, end-stage renal disease and congestive heart failure. The reasons for the racial disparities in elevated blood pressure and hypertension-related outcomes risk remain unclear. However, the implications of the disparities of hypertension for prevention and clinical management are substantial identifying African American men and women with excel hypertension risk and warranting interventions focused on these differences. In addition, focused research to identify the factors attributed to these disparities in risk burden is an essential need to address the evidence gaps.

Introduction

The racial disparities in hypertension and hypertension-related disease outcomes have been related mortality morbidity risks compared with their white counterparts. These excess risks from elevated blood pressure have a dramatic effect on life expectancy for African-American men and women which is significantly less than for Caucasian Americans. Stroke mortality risks are two-fold greater for African Americans.[1] End-stage renal disease is five times more common for African-American men and women. In addition, the age of onset of diseases such as stroke is considerably earlier for African Americans. For example, a 45-year-old African-American man residing in the Southeast has the stroke risk of a 55-year-old white man in the Southeast and a 65-year-old white man residing in the Midwest.[1] While high blood pressure affects all segments of the population, high blood pressure rates are more prevalent among African-American men and women.[2] The increased prevalence and relative risks constitute significant population attributable risks.[3] Specifically, the population attributable risk for hypertension and 30-year mortality among white men was 23.8% compared with 45.2% among black men and 18.3% for white women compared with 39.5% for black women. These excess disease risks have been long recognized and reported from the Evans County Heart Study[4] and the Charleston Heart Study[5] which were both initiated in 1960 specifically to study these racial disparities in cardiovascular disease in adults. Similarly, the Bogalusa Heart Study[6] assessed the racial differences in children and young adults. More recently, the Jackson Heart Study [7] has been established to assess

cardiovascular risk factors in this population. Further, the REasons for Geographic And Racial Differences in Stroke (REGARDS) study has further documented and confirmed the racial and geographic differences in awareness, treatment, and control of hypertension.[8] .With these large epidemiology studies, high blood pressure has been a common significant factor associated with the excess disease burden for African Americans.[9]

Blood Pressure and Hypertension Levels

Nearly one-third of the adult population in the United States are considered to have hypertension with elevated blood pressure (>= 140/90 mmHg) and/or being treated with antihypertensive medication. The prevalence of hypertension is higher in both middle-aged and older African Americans compared with non-Hispanic whites.[10,11] As presented in Figure 1, data from the National Health and Nutrition Examination Survey (NHANES), show the racial disparities with black men and women having significantly higher rates of hypertension than white men and women.[12 ,13] The prevalence rates increased for all four race-sex groups from 1988 –1994 period to 2009-2010. However, the racial disparities in hypertension prevalence remained consistent over the time periods. These racial differences are evidence at all ages. Blacks are found to develop hypertension at an earlier age than whites. An assessment of US children aged 8–17 years found systolic blood pressures to be 2.9 mmHg and 1.6 mmHg higher in black boys and girls compared with age-matched white boys and girls.[14] With the consistent racial differences at all ages it is evidence disparities in hypertension represent a lifetime consideration.,[15,16,17]

Hypertension Treatment and Control

While large-scale clinical trials have consistently demonstrated that the control of elevated blood pressure significantly reduces the risk for major cardiovascular disease, stroke and end-stage renal disease outcomes, a substantial portion of hypertensive patients do not achieve blood pressure control.[15] Data from the National Health and Examination Survey suggest that blood pressure is controlled for less than two-thirds of all patients on antihypertensive medications. [12,18] African Americans demonstrated poorer blood pressure control compared with Caucasians. Figure 2 presents the hypertension control rates for all four race-sex groups from 1988 to 2010.While the high blood pressure control rates improved from the 1988-1994 period to the 2009-2010 period for all four race-sex groups, the racial disparities remained consistent. These findings of disparities in in hypertension control are consistent with other studies.[8,11,12,19-21]The racial differences in control rates cannot be attributed to differences in rates of awareness and treatment.[8,9,11,12,15,18,21,22] Rates of awareness of hypertension as well as treatment patterns of antihypertensive therapy are similar for both race groups and even better among black men and women compared to white men and women. Likewise, treatment with non-pharmacological therapy does not explain the racial disparities in hypertension control. Results from clinical trials have included race in results with suggested treatment effects for the various racial groups. Dietary factors including sodium and potassium, while different for blacks and whites, do not explain the racial disparities in hypertension. The Dietary Approaches to Stop Hypertension (DASH) diet with sodium restriction found better BP reduction for African

Americans than Caucasians, indicating that black individuals may respond differently than whites.[23,24] Similarly, treatment of elevated blood pressure with antihypertensive medications and different medications may produce different effects in African Americans and whites. Calcium channel blockers and diuretics have been proposed as being particularly effective for African Americans with hypertension.[25-27] Angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs) have not been shown to be as effective in black populations compared with white populations.[26-28] Similarly, ACE inhibitors, ARBs, and β blockers have been reported to be less effective in blacks with heart failure compared with white patients.[29] However, it is important to consider sample size and confounders as well as study design when interpreting these results.

Hypertension Risks

The higher hypertension prevalence at earlier ages and more severe blood pressure levels correlate with the higher disease risks for blacks compared with whites. The risk ratios for stage 1 hypertension (<=140/90 mm Hg) and stage 2 (>=160/95 mm Hg) are presented in Table 1 for the four race-sex groups and 30-year all cause morality.[3] The risk ratios are significant for all but are greater for black men and women. Likewise the risk ratios are higher in the more sever blood pressure levels for all four race-sex groups with higher risks for black men and women compared with white men and women.[3,30] The disparities of higher prevalence and greater risks from high blood pressure are most evidence with the population attributable risks which are nearly twice as great for black men and women (Table 2)

In addition to hypertension risk from categories, the racial disparity is also evident in blood pressure level. Table 3 shows results from REGARDS and an impact of a 10–mm Hg higher level of systolic blood pressure for white and black participants.[31] In the total cohort, there was a 14% increased risk of stroke associated with a 10–mm Hg higher SBP (hazard ratio [HR], 1.14; 95% CI, 1.08-1.21). However racial differences in this association were identified (P-value for interaction, .02) with an 8% increase in whites (HR, 1.08; 95% CI, 1.00-1.16) and a 24% increase in blacks (HR, 1.24; 95% CI, 1.14-1.35).[31] these disparities in risks remained evident after long-term follow-up of the Hypertension Detection and Follow-up Study.[32]

Factors Associated with Racial Disparities

While the disparities in blood pressure levels, hypertension prevalence and control, and high blood pressure risks are evidence, the factors associated with the race differences are less evident. However, several parameters are proposed that may contribute to the disparities.[33]

Salt sensitivity

While salt intake affects blood pressure in most individuals and populations, racial differences in intake as well as handling of sodium and potassium.[34] While the prevalence of salt sensitivity was similar for African American and Caucasian women, the magnitude of blood pressure increase was different. [35] Blood pressure increase was greater in African

Americans, with a positive association of salt sensitivity associated with Na Ca2 intake and the ratios of Na to Kand Ca2 to Mg2. [35]

Body mass

Racial differences in body mass index have long been recognized and suggestive of disparities in blood pressure level and hypertension prevalence. African Americans have been identified with higher rates of obesity and overweight at different age groups. [36,37] However, while body mass affects blood pressure level in both race groups, anthropometric measurements do not explain all of the disparities in high blood pressure levls.[34,36,37]

Resistant and refractory hypertension

Resistant hypertension is defined as uncontrolled blood pressure despite the use of 3 or more antihypertensive agent classes or controlled blood pressure with 4 or more agents.[38] Refractory hypertension represents the extreme phenotype of hypertension treatment failure and is defined as the use of 5 or more antihypertensive classes of medication with a systolic blood pressure of greater than or equal 140 mm Hg and/or diastolic blood pressure of greater than or equal 90 mm Hg.[39] The prevalence ratios for refractory hypertension when compared with individuals with resistant hypertension were 3.00 (1.68 – 5.37) for African Americans.[39]

Likewise , there are numerous other factors with significant racial differences that could affect the disparities in hypertension including social determinants, access to care, fetal/early life origins, and differential treatment response.[33,40-43]

Conclusions and Implications

The racial disparities in hypertension and hypertension risks have significant implications for high blood pressure prevention, management and control programs and strategies, as well as gaps in research. Decades of hypertension control efforts have been attributed in part to the decline in stroke mortality identified for the past decades.[44] While, clinical guidelines and prevention strategies recognize the racial disparities in risks from hypertension,[45,46] the evidence from clinical trials and clinical studies is often inadequate and insufficient with regards to for high risk populations such African Americans.[47] Likewise there remains evidence gaps for the factors associated with the disparities. Thus, the evidence-based guidelines for prevention, treatment and management of hypertension inadequately address the excess risk of high blood pressure for African Americans. The opportunity is great for the implementation of research epidemiological studies and clinical trials focused on the assessment of the racial disparities in blood pressure levels and hypertension-risks. These results could be used to implement strategies to close the racial disparity gap in high blood pressure risks.

References

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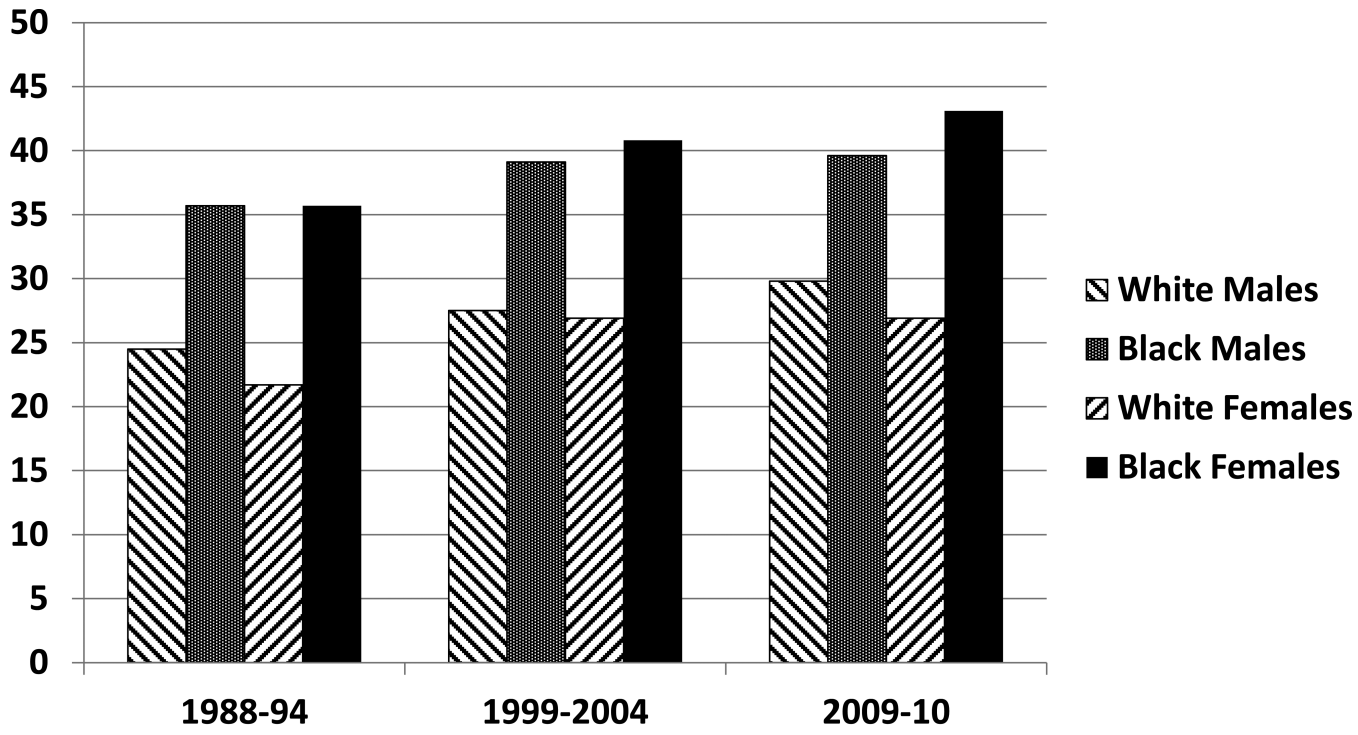

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Figure 1.

Prevalence of hypertension (percent of adult population). U.S. 1988-94 and 1999-2004 Adapted from: Cutler JA, Sorlie PD, Wolz M, Thom T, Fields LE, Roccella EJ. Trends in Hypertension Prevalence, Awareness, Treatment, and Control Rates in United States Adults Between 1988 –1994 and 1999 –2004. Hypertension. 2008;52:818-827; and Guo F, He D, Zhang W, Walton G. Trends in prevalence, awareness, management, and control of hypertension among United States adults 1999 to 2010. J AM Coll Cardiol 2012;60:599-606

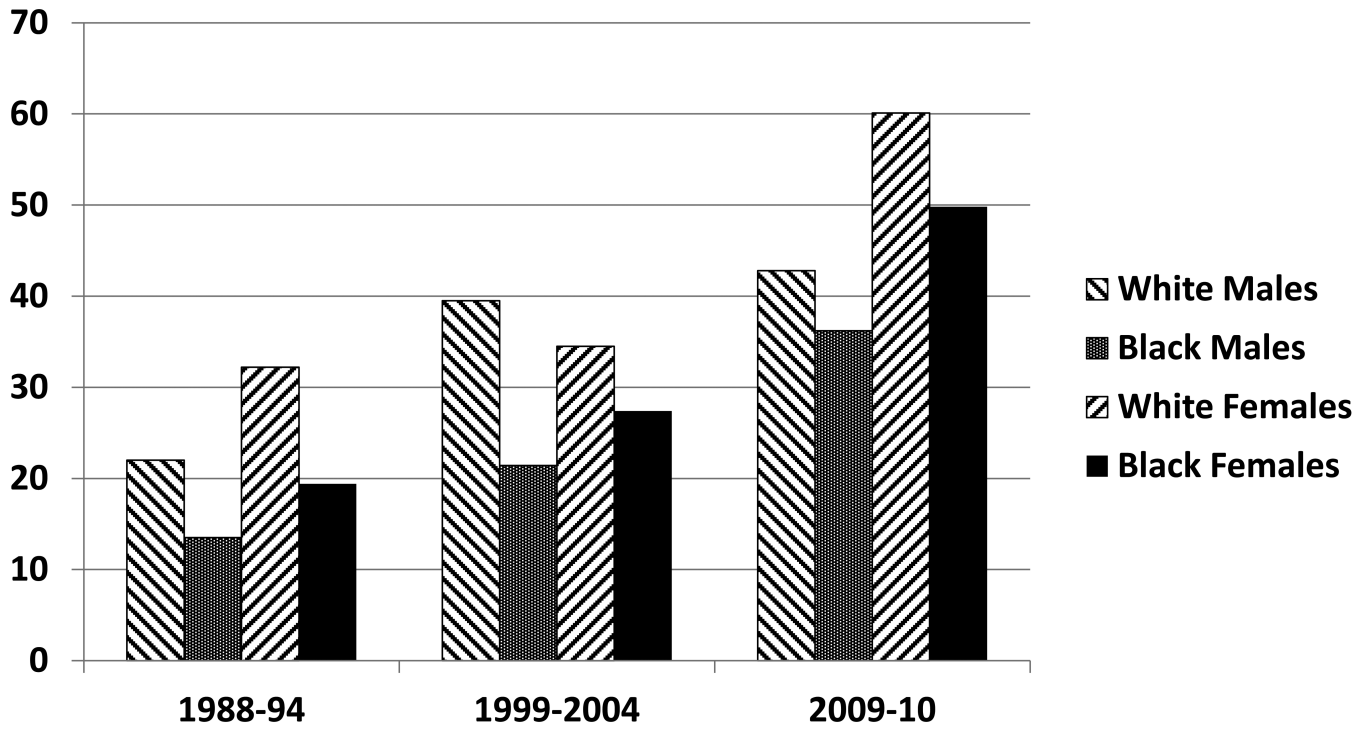

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Figure 2.

Percent of hypertensive adult population with controlled blood pressure levels. U.S. 1988-94, 1999-2004 and 2009-10

Adapted from: Cutler JA, Sorlie PD, Wolz M, Thom T, Fields LE, Roccella EJ. Trends in Hypertension Prevalence, Awareness, Treatment, and Control Rates in United States Adults Between 1988 –1994 and 1999 –2004. Hypertension.2008;52:818-827; and Guo F, He D, Zhang W, Walton G. Trends in prevalence, awareness, management, and control of hypertension among United States adults 1999 to 2010. J AM Coll Cardiol 2012;60:599-606

Table 1

30-year mortality risk ratios and 95% CI for elevated blood pressure (140/90 mmHg and greater) adjusting for age, socio-economic status, smoking, high cholesterol and diabetes: Charleston and Evans County Heart Studies, 1960

	White Males	White Females	Black Males	Black Females
140/90	1.6 (1.2, 2.0)	1.4 (1.1, 2.0)	2.1 (1.3, 3.1)	2.0 (1.2, 2.8)
160/95	1.8 (1.3, 2.2)	2.0 (1.2, 2.6)	2.4 (1.5, 3.5)	2.4 (1.6, 3.2)

Adapted from: Lackland, D.T.; Keil, J.E.; Gazes, P.C.; Hames, C.G.; Tyroler, H.A. Outcomes of black and white hypertensive individuals after 30 years of follow-up. Clinical and Experimental Hypertension 17:1091-1105, 1995.

Table 2

30-year Population Attributable Risks for Hypertension and All-cause Mortality: Charleston Heart Study and Evans County Heart Study, 1960

White Males	23.8%
White Females	18.3%
Black Males	45.2%
Black Females	39.5%

Adapted from: Lackland, D.T.; Keil, J.E.; Gazes, P.C.; Hames, C.G.; Tyroler, H.A. Outcomes of black and white hypertensive individuals after 30 years of follow-up. Clinical and Experimental Hypertension 17:1091-1105, 1995.

Table 3

Hazard ratio and 95% CI for stroke and 10 mm Hg systolic blood pressure differential racial susceptibility, Reasons for Geographic and Racial Disparities in Stroke Study

Whites	Blacks
1.08 (1.0 – 1.16)	1.25 (1.14 – 1.35)

Adapted from: Howard G, Lackland DT, Kleindorfer DO, Kissela BM, Moy CS, Judd SE, Safford MM, Cushman M, Glasser SP, Howard VJ. Racial Differences in the Impact of Elevated Systolic Blood Pressure on Stroke Risk. JAMA Intern Med. 2013;173(1):46-51.