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Racial differences in blood pressure control following stroke: The REGARDS study

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Abstract

Background and Purpose: In the general population, Black adults are less likely than White adults to have controlled blood pressure (BP), and when not controlled, they are at greater risk for stroke compared with White adults. High BP is a major modifiable risk factor for recurrent stroke, but few studies have examined racial differences in BP control among stroke survivors.

Methods: We used data from the REasons for Geographic And Racial Differences in Stroke (REGARDS) study to examine disparities in BP control between Black and White adults, with and without a history of stroke. We studied participants taking antihypertensive medication who did and did not experience an adjudicated stroke (n=306 and 7,693 participants, respectively) between baseline (2003–2007) and a second study visit (2013–2016). BP control at the second study visit was defined as systolic BP (SBP) <130 mmHg and diastolic BP (DBP) <80 mmHg except for low-risk adults ≥65 years old (i.e., those without diabetes, chronic kidney disease, history of cardiovascular disease (CVD), and with a 10-year predicted atherosclerotic CVD risk <10%) for whom BP control was defined as SBP <130 mmHg.

Results: Among participants with a history of stroke, 50.3% of White compared to 39.3% of Black participants had controlled BP. Among participants without a history of stroke, 56.0% of White compared to 50.2% of Black participants had controlled BP. After multivariable adjustment, there was a tendency for Black participants to be less likely than White participants to have

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controlled BP, Prevalence ratio: 0.77, 95%CI: 0.59 – 1.02 for those with a history of stroke and 0.92, 95%CI: 0.88 – 0.97 for those without a history of stroke.

Conclusions: There was a lower proportion of controlled BP among Black compared with White adults with or without stroke, with no statistically significant differences after multivariable adjustment.

Keywords

hypertension; blood pressure; stroke; racial differences; Black; White

Hypertension is a leading risk factor for stroke, the third leading cause of death among women and the fifth leading cause of death among men in the US.[1] About 1 in 4 strokes are recurrent, and recurrent strokes are associated with a higher 30-day mortality (~41%) compared with first strokes (~22%).[2] Hypertension is recognized as the most important risk factor for a first or recurrent stroke.[3,4] Stroke is largely preventable if hypertension is treated and controlled.[5] Many randomized controlled trials have shown that lowering blood pressure (BP) results in a reduced risk for stroke.[6] Black adults in the general population have a lower likelihood for BP control compared with White adults.[7,8]

The 2014 American Heart Association/American Stroke Association (AHA/ASA) guidelines recommend resuming antihypertensive medication following an acute stroke in neurologically stable individuals who were previously treated and to initiate antihypertensive medication for those with systolic BP (SBP) ≥ 140 mm Hg or diastolic BP (DBP) ≥ 90 mm Hg.[4] Compared with previous guidelines, the 2017 American College of Cardiology (ACC)/AHA BP guideline set a lower BP target, SBP/DBP < 130/80 mm Hg, for adults with a history of stroke.[9] Few studies have evaluated racial differences in BP control among stroke survivors using the 2017 ACC/AHA BP guideline thresholds. The goal of the current study was to examine racial differences in BP control following a stroke using the 2017 ACC/AHA BP guideline thresholds. For comparison, we also examined racial differences in BP control for participants who did not experience a stroke. To address these goals, we analyzed data from the REasons for Geographic And Racial Differences in Stroke (REGARDS) study. We hypothesized that the likelihood of controlled BP would be lower among Black compared with White adults with or without a history of stroke.

Methods

Request to access the dataset from qualified researchers trained in human subject confidentiality research may be sent to the REGARDS executive committee at http://regardsstudy.org. The REGARDS study enrolled a population-based cohort of 30,239 non-Hispanic Black and White adults aged ≥ 45 years between 2003 and 2007 from across the contiguous US.[10] The REGARDS study oversampled Black adults and residents from the stroke buckle (Coastal North Carolina, South Carolina, and Georgia), and stroke belt (the remainder of North Carolina, South Carolina, Georgia, and Alabama, Tennessee, Arkansas, and Louisiana) of the southeastern US. The REGARDS study has been previously described in detail.[10,11] The REGARDS study was approved by the institutional review boards of the participating centers, and all participants provided written informed consent.

The current analysis using a cross-sectional design was restricted to participants who completed the REGARDS study second in-home examination, which was conducted between 2013 and 2016 (n=14,448). We excluded participants with incomplete information on SBP or DBP (n = 25) and those who did not have hypertension, defined below (n = 4,000). Of the remaining 10,423 participants, we excluded those who self-reported a prior stroke at baseline (n = 604) as medical records were not retrieved to confirm these prevalent events. We further excluded participants who were not taking antihypertensive medication at the time of the second in-home examination (n=1,939). After these exclusions, we analyzed data from 306 participants who had an adjudicated incident stroke between the first and second in-home visit and 7,693 participants without an adjudicated incident stroke between first and the second in-home visit (Figure I in the Data Supplement).

Data collection

Age, sex, race and education were self-reported at baseline. Income, marital status, alcohol consumption, smoking, physical activity and health insurance status were self-reported during a telephone interview conducted in conjunction with the second in-home study visit. After completion of the interview, the second in-home examination was conducted by a trained technician following standardized protocols. Height, weight and waist circumference were measured. Blood and urine specimens were collected and used to measure serum creatinine, serum glucose, and urinary albumin and creatinine. Diabetes was defined as a fasting serum glucose level ≥ 126 mg/dL, non-fasting serum glucose ≥ 200 mg/dL for those who did not fast, or self-reported glucose-lowering medication use. Chronic Kidney Disease (CKD) was defined by an albumin-to-creatinine ratio ≥ 30 mg/g or estimated glomerular filtration rate < 60 mL/min/1.73 m^2. Pill bottles for medications being taken by study participants in the two weeks prior to their study visit were reviewed as part of a medication inventory. Details on how these variables were ascertained are presented in Table I in the Data Supplement.

BP measurement

BP was measured two times following a standardized protocol after participants had rested for five minutes using an aneroid sphygmomanometer (American Diagnostic Corporation, Hauppauge, NY).[10] Quality control was monitored by central examination of digit preference, and retraining of technicians took place as necessary. The mean of the two measurements was used to defined SBP and DBP. Hypertension and controlled BP were defined using thresholds in the 2017 ACC/AHA BP guideline.[9] Hypertension was defined as SBP ≥ 130 mm Hg, DBP ≥ 80 mm Hg, or a self-reported prior diagnosis of hypertension by a healthcare provider in conjunction with antihypertensive medication use. Antihypertensive medication use was defined by responding “Yes” to both of the following questions “Has a doctor or other health professional ever told you that you have high BP?” and “Are you now taking any medicine for high BP?” and having one or more classes of antihypertensive medication identified during a medication inventory conducted during the second REGARDS in-home examination. BP control was defined as SBP < 130 mm Hg and DBP < 80 mm Hg, except for low-risk adults aged 65 years or older for whom BP control was defined as SBP < 130 mm Hg. Low-risk was defined by not having diabetes, CKD, or a

history of cardiovascular disease (CVD) but having a 10-year predicted atherosclerotic CVD risk < 10%.

Assessment of history of stroke

A standardized questionnaire was administered during every six-month telephone interview to assess new stroke symptoms, hospitalizations, or ambulatory evaluations for stroke or transient ischemic attack (TIA). When any of these events were reported, the participant's medical records were retrieved and reviewed by at least two physicians including a neurologist. Participants who experienced a focal neurological deficit lasting ≥ 24 hours, the World Health Organization definition of stroke, or a focal or non-focal neurological deficit with positive imaging, clinical definitions of stroke, were considered to have a stroke event.[12,13] A history of stroke at the second in-home study examination was defined by an adjudicated incident stroke between the baseline and second in-home examination.

Statistical analysis

Characteristics and the percentage of participants with controlled BP were calculated by race for those with and without a history of stroke, separately. Three Poisson models with robust variance estimators and progressive adjustment were fitted to calculate prevalence ratios (PR) for having controlled BP for Black compared with White participants among those with and without a history of stroke, separately. The first model included adjustment for age, sex, and region of residence. The second model included additional adjustment for income, education, and marital status. The third model included variables in the second model and body mass index (BMI), physical activity, alcohol consumption, current smoking, CKD, diabetes, and the number of antihypertensive medication classes being taken. Differences in the association between race and BP control for participants with and without a history of stroke were assessed by a test of interaction. In a sensitivity analysis, we defined a history of stroke as an adjudicated incident stroke between baseline and the second in-home examination or a self-reported history of stroke at baseline. In another sensitivity analysis, we used inverse probability of attrition weighting to account for potential selection bias from study withdrawal for participants who did not attend the REGARDS second visit but were alive at the time of the second visit. Detailed information on the creation of the inverse probability of attrition weighting is provided in the Data Supplement. We conducted a sub-group analysis of the association between race and BP control among those with and without a history of stroke, separately, stratified by sex. Differences in the association of race with BP control by sex, for participants with and without a history of stroke, were assessed by a test of interaction.

Next, we calculated the PR for BP control associated with the study covariates one at a time including adjustment for age, sex, and region of residence among White and Black participants, with and without a history of stroke, separately. The proportion of White and Black participants taking each class of antihypertensive medication was calculated for those with and without a history of stroke, separately.

We conducted a supplemental analysis defining hypertension and BP control according to the seventh Joint National Committee (JNC 7) guideline.[14] For this analysis, hypertension

was defined as SBP ≥ 140 mm Hg, DBP ≥ 90 mm Hg, or antihypertensive medication use. BP control was defined as SBP < 140 mm Hg and DBP < 90 mm Hg except for participants with CKD or diabetes, wherein BP control was defined as SBP < 130 mm Hg and DBP < 80 mm Hg. For all analyses, missing data were imputed with 10 datasets using chained equations. The number and percentage of participants with missing data for each analysis covariate are reported in Table II in the Data Supplement. All analyses were conducted using SAS, version 9.4 (SAS Institute, Cary, North Carolina).

Results

Among the 306 participants with a history of stroke, Blacks were younger, less likely to be men, had a lower annual household income and less education and were less likely to be married than Whites (Table 1). Additionally, Blacks were less likely than Whites to drink alcohol and participate in physical activity four or more times per week and more likely to be a current smoker, have BMI ≥ 30 kg/m^2 and diabetes, and to be taking three or more classes of antihypertensive medication. Among participants without a history of stroke, Blacks were younger, less likely to be men, have an annual household income ≥ $75,000 per year, be a college graduate, be married, and consume alcohol and more likely to have BMI ≥ 30 kg/m^2 and diabetes and to be taking ≥ 3 classes of antihypertensive medication than Whites. The classes of antihypertensive medication being taken among Black and White adults with and without a history of stroke are provided in Table III in the Data Supplement. Table IV in the Data supplement shows the characteristics of participants who attended and did not attend the second study visit by history of stroke and race, separately.

Racial differences in BP control among participants with and without history of stroke

Among participants with history of stroke, 50.3% of Whites and 39.3% of Blacks had controlled BP (Table 2). Among participants without a history of stroke, 56.0% of White participants and 50.2% of Black participants had controlled BP. After full multivariable adjustment, there was a tendency for Black participants to be less likely than White participants to have controlled BP, PR: 0.77, 95% CI: 0.59 – 1.02 for those with a history of stroke and 0.92, 95% CI: 0.88 – 0.97 for those without a history of stroke. There was no evidence that the association of race with BP control differed between participants with and without a history of stroke (each p-value for interaction > 0.05). For both participants with and without a history of stroke, Black adults were less likely than White adults to have BP control when we defined history of stroke as an adjudicated incident stroke between baseline and the second in-home examination or a self-reported history of stroke at baseline (Table V in the Data Supplement). Additionally, these associations were present when we used inverse probability of attrition weighting to account for REGARDS participants who did not attend the second in-home study visit (Table VI in the Data Supplement). There was no evidence of effect modification between race and sex on BP control among those with and without a history of stroke (Table VII in the data Supplement).

Factors associated with BP control

For White participants with a history of stroke, having abdominal obesity was associated with a lower likelihood of BP control (Table 3). For Black participants with history of

stroke, residing in the stroke belt versus non-stroke belt region of the US, abdominal obesity, and current smoking were associated with lower likelihood of BP control. Among Whites and Blacks without history of stroke, residing in the stroke belt versus other non-belt regions, abdominal obesity, a BMI ≥ 30 versus < 25 kg/m^2, diabetes and CKD were associated with a lower likelihood of BP control. Annual household income ≥ $35,000, being a college graduate versus less than a high school education, being married, engaging in physical activity 4 or more times a week and current alcohol use were associated with higher likelihood of BP control among Whites and Blacks without history of stroke.

BP control defined using the JNC7 BP guideline

When defined using the JNC 7 guideline, 59.8% of White participants and 52.5% of Black participants with history of stroke had controlled BP (Table VIII in the Data Supplement). Among participants without history of stroke, 68.3% of White participants and 62.8% of Black participants had controlled BP. The multivariable adjusted PR for BP control comparing Blacks and Whites was 0.93, 95% CI: 0.76 – 1.15 for those with a history of stroke and 0.97, 95% CI: 0.94 – 1.00 for those without a history of stroke. There was no evidence that the association of race with BP control defined using the JNC 7 BP guideline differed for participants with versus without a history of stroke.

Discussion

In this large, geographically diverse cohort, a lower proportion of Black compared with White participants with a history of stroke had controlled BP, but the association was not statistically significant after full multivariable adjustment. Also, among those without a history of stroke, Black participants were less likely than White participants to have controlled BP. The association was marginally statistically significant after multivariable adjustment. There was no evidence that the association of race with BP control differed between participants with versus without history of stroke.

The lower proportion of Black versus White participants without history of stroke with controlled BP is consistent with prior studies of the general population.[15–17] In NHANES 2017 – 2018, 53.2% of non-Hispanic Black compared with 68.2% of non-Hispanic White US adults taking antihypertensive medication had controlled BP.[8] Additionally, Black:White disparities in BP control have been reported in randomized trials where standardized antihypertensive treatment protocols were applied.[18,19] For example, in the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial, Black participants were 25% less likely to have controlled BP after three years of follow-up compared with White participants.[18] The current results add to the evidence of a racial disparity in BP control and highlight the need to improve BP control in the general population.

Among those with a history of stroke in the current study, Blacks were less likely than Whites to have controlled BP. This finding is consistent with prior studies. In NHANES 2003–2014, 55.9% of Black versus 66.8% of White stroke survivors had controlled BP.[20] In a study of patients with hypertension from 14 Kaiser Permanente hospitals in Northern California following a stroke, 52.7% of Black patients versus 61.4% of White patients

had controlled BP at discharge.[21] These results highlight the need for evidence-based interventions to reduce racial disparities in BP control among stroke survivors.

Black adults disproportionately experience the adverse health effects of uncontrolled BP including heart failure, stroke, and premature mortality.[9,22] Although the overall stroke incidence has been decreasing over the past several decades among US adults, racial disparities in stroke incidence have widened.[23,24] This disparity may be due in part to the differences in the prevalence of hypertension and hypertension control among non-Hispanic Black adults, as well as the differential effect of hypertension on stroke incidence.[25] There is a need for evidence-based interventions to improve BP control among Black adults and to reduce the racial-ethnic disparities in primary and secondary stroke.

The panel members appointed to the JNC 8 guideline recommended that Black adults initiating antihypertensive medication do so with a thiazide-type diuretic or calcium channel blocker when there is no compelling indication for a specific class of antihypertensive medication.[26] This recommendation was based on randomized trials showing that Black adults have a smaller reduction in BP and risk for CVD events than White adults when treated with renin-angiotensin system blockers.[27,28] Beta-blockers have also been shown to be associated with higher risks of CVD[29,30] and CVD mortality[9] compared with other antihypertensive medication classes among patients with hypertension. In the present study, Black participants were more likely to be taking guideline recommended BP lowering medication compared with White participants. However, a substantial proportion of Black participants were taking an angiotensin converting enzyme inhibitor, angiotensin receptor blocker or beta blocker. Efforts are needed to increase guideline recommended antihypertensive medication classes among Black adults with hypertension.

Black adults initiating antihypertensive medication are more likely to have low adherence to, and discontinue, antihypertensive medication compared with White adults.[31] Medication non-adherence has been identified as a major contributing factor to uncontrolled BP.[31,32] Also, social aspects including structural racism, discrimination and neighborhood segregation may contribute to racial disparities in BP control.[33,34] Black adults are more likely to live in segregated disadvantaged neighborhoods characterized by poverty with limited access to healthy foods, inadequate community resources, and higher rates of violent crime.[35,36] Also, disadvantaged neighborhoods may induce stress,[36] and may not be conducive to engaging in behaviors associated with lower BP including physical activity.[37] Interventions to address adverse social determinants of health may contribute to eliminating racial disparities in BP control.

Recently, the US Surgeon general published A Call-to-Action on hypertension control that discussed health inequities including racial-ethnic disparities in BP control.[38] In the Call-to- Action, the Surgeon General provided evidence-based strategies to improve BP control. These strategies include increasing the use of the electronic health record systems to improve clinical workflows and provide decision support tools, implementing BP treatment protocols, expanding the use of integrated care teams, providing clinicians with feedback on their performance, prioritizing medication intensification and medication adherence, promoting shared management of BP through self-measurement of BP. These strategies have

proven effective in some healthcare systems and may be applied in other settings. Adopting these approaches in diverse clinical and community settings may facilitate increases in BP control and reduce racial and ethnic disparities in primary and secondary stroke risk.

The current study provides evidence of racial disparities in BP control following stroke between Black and White adults in a contemporary cohort of stroke survivors while using BP thresholds in the 2017 ACC/AHA BP guideline. In addition, stroke events were adjudicated in the REGARDS study. Despite these strengths, there are known and potential limitations. BP was measured at a single visit. Guidelines recommend estimating BP as the average of measurements obtained at two or more visits.[9,39] Therefore, some participants without hypertension may have been categorized as having hypertension while other participants with hypertension may have been categorized as not having hypertension. We included a modest sample size (n=306) of participants with an adjudicated incident stroke. Only REGARDS participants who completed the second in-home visit were included in the current analysis. However, there was no evidence of selection bias when we used inverse probability of attrition weighting to account for participants who did not attend the second study visit.

In conclusion, in this contemporary cohort of US adults, the proportion of Black and White adults with and without a history of stroke with BP control was low. Focused interventions are needed to improve BP control among Blacks and Whites, including stroke survivors.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Non-standard Abbreviations and Acronyms

BP	blood pressure
AHA	American Heart Association
ASA	American Stroke Association
SBP	systolic blood pressure
DBP	diastolic blood pressure
ACC	American College of Cardiology
REGARDS	REasons for Geographic And Racial Differences in Stroke
CKD	chronic kidney disease
CVD	cardiovascular disease
TIA	transient ischemic attack
PR	prevalence ratio
BMI	body mass index
JNC	Joint National Committee
NHANES	National Health and Nutrition Examination Survey

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Table 1.

Characteristics of White and Black REGARDS study participants with hypertension by history of stroke.

Characteristics	History of Stroke		No history of stroke	
	Whites (n = 161)	Black (n = 145)	White (n = 4288)	Black (n = 3405)
Age, years	76.9 (7.6)	74.5 (8.5)	73.6 (8.0)	71.9 (8.1)
Men, n (%)	95 (59.0)	58 (40.0)	2090 (48.7)	1114 (32.7)
Region, [*,n] (%)				
Non-stroke belt	69 (42.9)	70 (48.3)	1782 (41.6)	1523 (44.7)
Stroke buckle	33 (20.5)	26 (17.9)	1050 (24.5)	676 (19.9)
Stroke belt	59 (36.7)	49 (33.8)	1456 (34.0)	1206 (35.4)
Annual household income, n (%)				
Less than $20,000	20 (15.2)	43 (37.4)	362 (9.8)	743 (25.3)
$20,000 to < $35,000	48 (36.4)	35 (30.4)	948 (25.8)	875 (29.7)
$35,000 to < $75,000	44 (33.3)	26 (22.6)	1402 (38.1)	939 (31.9)
$75,000 and above	20 (15.2)	11 (9.6)	966 (26.3)	385 (13.1)
Education, n (%)				
Less than high school	14 (8.7)	25 (17.2)	229 (5.3)	467 (13.7)
High school graduate	36 (22.4)	49 (33.8)	1012 (23.6)	978 (28.7)
Some college	49 (30.4)	37 (25.5)	1133 (26.4)	966 (28.4)
College graduate	62 (38.5)	34 (23.5)	1914 (44.6)	993 (29.2)
Married, n (%)	93 (58.1)	57 (39.6)	2732 (64.0)	1414 (41.8)
Abdominal obesity, n (%)	93 (57.8)	91 (64.5)	2537 (59.3)	2288 (67.6)
Current alcohol use, n (%)	75 (46.6)	37 (25.7)	2084 (48.9)	1075 (31.8)
Physical activity, n (%)				
None	82 (51.3)	73 (51.1)	1812 (42.9)	1458 (43.4)
1 to 3 times/week	44 (27.5)	53 (37.1)	1391 (33.0)	1216 (36.2)
4+ times/week	34 (21.3)	17 (11.9)	1019 (24.1)	685 (20.4)
Current smoking, n (%)	13 (8.1)	23 (15.9)	234 (5.5)	308 (9.2)
BMI, kg/m^2 n (%)				
< 25	42 (26.3)	25 (17.5)	951 (22.3)	528 (15.6)
25 to 29	65 (40.6)	51 (35.7)	1627 (38.1)	1084 (32.0)
≥ 30	53 (33.1)	67 (46.9)	1697 (39.7)	1771 (52.4)
Diabetes, n (%)	53 (34.4)	68 (48.9)	1069 (25.7)	1322 (40.4)
Chronic kidney disease, n (%)	81 (52.6)	76 (60.8)	1837 (45.7)	1294 (42.4)
Systolic BP, mm Hg	128.9 (16.3)	130.1 (16.4)	125.9 (13.9)	127.3 (14.8)
Diastolic BP, mm Hg	74.2 (10.2)	74.4 (10.8)	73.3 (8.9)	74.6 (9.2)
Health insurance, n (%)	160 (100.0)	140 (97.2)	4236 (99.3)	3346 (99.1)
# of classes of antihypertensive medications, n (%)				
1	37 (23.0)	24 (16.6)	1410 (32.9)	738 (21.7)

Characteristics	History of Stroke		No history of stroke	
	Whites (n = 161)	Black (n = 145)	White (n = 4288)	Black (n = 3405)
2	58 (36.0)	46 (31.7)	1519 (35.4)	1269 (37.3)
≥ 3	66 (41.0)	75 (51.7)	1359 (31.7)	1398 (41.1)
Time since last stroke, years	4.1 (2.8)	4.3 (2.8)	--	--

Numbers are mean (standard deviation) or frequency (percentage).

*Stroke buckle includes coastal North Carolina, South Carolina and Georgia. Stroke belt includes the remaining parts of North Carolina, South Carolina and Georgia, and Tennessee, Mississippi, Alabama, Louisiana and Arkansas. Non-stroke belt includes the remaining 40 contiguous US states and the District of Columbia.

Abdominal obesity was defined as a waist circumference >102cm for men and >88cm for women.

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BMI: body mass index.

BP: blood pressure.

Table 2.

Prevalence ratios for controlled blood pressure comparing Black and White REGARDS study participants with and without a history of adjudicated stroke, separately.

	History of stroke		No history of stroke		
	White (n = 161)	**Black (n = 145)**	**White (n = 4288)**	**Black (n = 3405)**	***P*-interaction***
Proportion	50.3%	39.3%	56.0%	50.2%	
Prevalence ratio (95% confidence interval)					
Model 1	1 (Ref)	0.76 (0.58 – 0.98)	1 (Ref)	0.89 (0.85 – 0.92)	0.268
Model 2	1 (Ref)	0.76 (0.58 – 1.00)	1 (Ref)	0.92 (0.88 – 0.96)	0.284
Model 3	1 (Ref)	0.77 (0.59 – 1.02)	1 (Ref)	0.92 (0.88 – 0.97)	0.329

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* *P*-interaction is the p-value for interaction between race (Black vs. White) and having a history of stroke on blood pressure control.

Model 1: adjusted for age, sex, and region of residence.

Model 2: adjusted for the variables in model 1 and income, education, and marital status.

Model 3: adjusted for the variables in model 2 and body mass index, physical activity, alcohol consumption, current smoking, chronic kidney disease, diabetes, and number of antihypertensive medication classes being taken.

Blood pressure control was defined as systolic blood pressure < 130 mm Hg and diastolic blood pressure < 80 mm Hg for all participants except those 65 years or older without diabetes, chronic kidney disease, history of cardiovascular disease, and with a 10-year predicted atherosclerotic cardiovascular disease risk < 10% where blood pressure control was defined as systolic blood pressure < 130 mm Hg.

Table 3.

Prevalence ratios for controlled blood pressure associated with study covariates among White and Black REGARDS study participants with and without a history of adjudicated stroke.

	History of Stroke		No History of Stroke	
Characteristic	**White (n= 161)**	**Black (n = 145)**	**White (n = 4288)**	**Black (n =3405)**
Age, per 10 years	1.05 (0.86 – 1.29)	0.98 (0.76 – 1.26)	0.99 (0.96 – 1.03)	0.99 (0.95 – 1.03)
Men	0.79 (0.58 – 1.07)	1.05 (0.69 – 1.59)	0.96 (0.91 – 1.01)	0.90 (0.84 – 0.97)
Region*				
Non-stroke belt	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)
Stroke buckle	1.00 (0.68 – 1.47)	0.81 (0.46 – 1.40)	0.96 (0.90 – 1.03)	0.96 (0.88 – 1.05)
Stroke belt	0.87 (0.60 – 1.24)	0.60 (0.36 – 1.00)	0.92 (0.86 – 0.98)	0.83 (0.76 – 0.90)
Income				
Less than $20,000	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)
$20,000 - < $35,000	1.14 (0.71 – 1.84)	1.34 (0.78 – 2.32)	1.17 (1.03 – 1.32)	1.10 (0.99 – 1.23)
$35,000 - < $75,000	0.88 (0.52 – 1.52)	1.21 (0.66 – 2.23)	1.21 (1.08 – 1.36)	1.21 (1.10 – 1.33)
$75,000 and above	1.31 (0.73 – 2.36)	1.66 (0.78 – 3.52)	1.24 (1.11 – 1.40)	1.19 (1.05 – 1.34)
Education				
Less than High School	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)
High school graduate	1.15 (0.63 – 2.10)	0.90 (0.51 – 1.58)	1.04 (0.91 – 1.20)	1.04 (0.92 – 1.16)
Some college	1.18 (0.65 – 2.12)	0.81 (0.43 – 1.50)	1.09 (0.95 – 1.25)	1.12 (1.00 – 1.26)
College graduate	0.92 (0.50 – 1.69)	0.88 (0.48 – 1.61)	1.12 (0.98 – 1.28)	1.08 (0.96 – 1.22)
Married	0.95 (0.65 – 1.38)	1.33 (0.84 – 2.12)	1.08 (1.01 – 1.14)	1.05 (0.98 – 1.13)
Abdominal obesity	0.63 (0.47 – 0.86)	0.66 (0.43 – 1.02)	0.85 (0.80 – 0.89)	0.81 (0.75 – 0.86)
BMI, kg/m^2				
< 25	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)
25 – 29	0.95 (0.67 –1.34)	0.87 (0.51 – 1.46)	0.96 (0.90 – 1.02)	0.95 (0.87 – 1.05)
≥ 30	0.79 (0.52 – 1.19)	0.68 (0.39 – 1.18)	0.81 (0.75 – 0.87)	0.78 (0.71 – 0.86)
Current smoking	1.33 (0.83 – 2.14)	0.28 (0.10 – 0.81)	0.97 (0.86 – 1.09)	0.92 (0.81 – 1.05)
Current alcohol use	1.07 (0.77 – 1.48)	0.63 (0.36 – 1.11)	1.05 (1.00 – 1.11)	1.04 (0.97 – 1.12)
Physical activity				
None	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)
1 – 3 times/week	1.09 (0.74 – 1.59)	1.31 (0.86 – 1.98)	1.01 (0.95 – 1.07)	1.07 (0.99 – 1.15)
4+ times/week	1.11 (0.76 – 1.64)	0.91 (0.43 – 1.95)	1.05 (0.98 – 1.12)	1.05 (0.96 – 1.15)
Diabetes	0.78 (0.53 – 1.14)	1.00 (0.67 – 1.49)	0.94 (0.89 – 1.01)	0.96 (0.90 – 1.03)
Chronic Kidney disease	1.20 (0.86 – 1.66)	0.76 (0.49 – 1.19)	0.94 (0.88 – 0.99)	0.89 (0.83 – 0.96)
# of antihypertensive medications classes				
1	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)
2	0.91 (0.60 – 1.37)	1.37 (0.73 – 2.56)	1.04 (0.97 – 1.11)	1.03 (0.94 – 1.12)
≥3	1.08 (0.72 – 1.62)	1.04 (0.56 – 1.94)	1.03 (0.96 – 1.10)	0.98 (0.90 – 1.07)

Numbers in table are prevalence ratio (95% confidence interval) adjusted for age, sex, and region of residence.

*Stroke buckle includes coastal North Carolina, South Carolina and Georgia. Stroke belt includes the remaining parts of North Carolina, South Carolina and Georgia, and Tennessee, Mississippi, Alabama, Louisiana and Arkansas. Non-stroke belt includes the remaining 40 contiguous US states and the District of Columbia.

Blood pressure control was defined as systolic blood pressure < 130 mm Hg and diastolic blood pressure < 80 mm Hg for all participants except those 65 years or older without diabetes, chronic kidney disease, history of cardiovascular disease, and with a 10-year predicted atherosclerotic cardiovascular disease risk < 10% where blood pressure control was defined as systolic blood pressure < 130 mm Hg.

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BMI: body mass index.