

Research Article

Is there an association between the prevalence of atrial fibrillation and severity and control of hypertension? The REasons for Geographic And Racial Differences in Stroke study



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Abstract

The association of atrial fibrillation (AF) with the severity and control of hypertension (HTN) remains unclear. We analyzed data from the national biracial cohort of REasons for Geographic And Racial Differences in Stroke study. The AF prevalence ratios were estimated and full multivariable adjustment included demographics, risk factors, medication adherence, HTN duration, and antihypertensive medication classes. Of the 30,018 study participants (8.6% with AF), 4386 had normotension (4.3% with AF), 5916 had prehypertension (4.3 with AF%), 12,294 had controlled HTN (11.2% with AF), 5587 had uncontrolled HTN (8.1% with AF), 547 had controlled apparent treatment-resistant hypertension (aTRH) (19.2% with AF), and 1288 had uncontrolled aTRH (15.5% with AF). Compared with normotension, the AF prevalence ratios for prehypertension, controlled HTN, uncontrolled HTN, controlled aTRH, and uncontrolled aTRH groups in fully adjusted model were 1.01 (95% confidence interval: 0.84, 1.21), 1.42 (1.18, 1.71), 1.37 (1.14, 1.65), 1.17 (0.86, 1.58), and 1.42 (1.10, 1.84), respectively ($P < .001$). The prevalence of AF was similar among persons with HTN regardless of blood pressure level and antihypertensive treatment resistance. *J Am Soc Hypertens* 2016;10(7):578–586. © 2016 American Society of Hypertension. All rights reserved.

Keywords: Antihypertensive medications; beta-blockers; blood pressure; treatment-resistant hypertension.

Introduction

Atrial fibrillation (AF), the most common sustained cardiac arrhythmia, increases the risk of stroke, heart failure, and all-cause mortality.^{1,2} Systemic hypertension (HTN) is a major modifiable risk factor for AF.^{3–8} Left ventricular

diastolic dysfunction from long-standing HTN leads to left atrial remodeling and dilation resulting in increased AF risk.^{3,4,9–11} Prehypertension, defined as systolic blood pressure (SBP) 120–139 mm Hg and/or diastolic blood pressure (DBP) of 80–89 mm Hg, has been associated with the development of frank HTN and AF.^{12–14} Increased

Supplemental Material can be found at www.ashjournal.com.

Conflict of interest: None.

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prevalence of prehypertension has been associated with aging and black race,¹⁵ but the impact of age, race, and gender on the association of prehypertension and AF remains unknown. Resistant HTN, an extreme phenotype of HTN, is defined as SBP ≥ 140 mm Hg and/or DBP ≥ 90 mm Hg on ≥ 3 antihypertensive medication classes.¹⁶ The term apparent treatment-resistant HTN (aTRH) has been used in epidemiologic studies to describe cases of resistant HTN in which pseudoresistance (ie, falsely labeled as having resistant HTN) is not reliably excluded.

aTRH is further classified into controlled aTRH (SBP < 140 mm Hg and DBP < 90 mm Hg on ≥ 4 antihypertensive medication classes) and uncontrolled aTRH (SBP ≥ 140 mm Hg and/or DBP ≥ 90 mm Hg with ≥ 3 antihypertensive medication classes).^{17,18} In persons with HTN, the prevalence of AF has been reported to be higher among those with uncontrolled HTN compared to controlled HTN.⁸ Antihypertensive medications such as beta-blockers and angiotensin-converting enzyme inhibitors (ACEI) are associated with decreased AF risk.^{19–21} However, the prevalence of AF among hypertensive persons with treatment resistance based on the number of antihypertensive medications used and blood pressure (BP) control remains unknown.

In this study, using data from the REasons for Geographic and Racial Disparities in Stroke (REGARDS) study, we determined the cross-sectional association between AF and BP level and HTN severity (defined by the number of antihypertensive medication class used). We hypothesized that the prevalence of AF would increase with increasing HTN severity and poorer BP control; we further investigated differences in this association by age, gender, race, and geographical region.

Methods

REGARDS is a longitudinal study designed to investigate factors contributing to excess stroke mortality across the southeastern United States and among blacks. The details of REGARDS sample and study recruitment have been previously described.²² Briefly, the REGARDS study includes a cohort of 30,239 black and white adults ≥ 45 years old recruited from the 48 continental US states between January 2003 and October 2007. The study was designed to balance on gender and race, with oversampling from regions in the Southeastern United States with high stroke incidence. The final cohort included 55% women, 42% blacks, and 55% in the stroke belt (defined as North Carolina, South Carolina, Georgia, Alabama, Mississippi, Arkansas, Tennessee, and Louisiana). Briefly, participants were recruited via mail and telephone. Trained personnel using computer-assisted telephone interview obtained baseline demographic information and medical history. Anthropometric and BP measurements, venous blood samples, brief physical examination,

electrocardiogram (ECG), and pill bottle review of medications were conducted during the in-home visit 3–4 weeks after the telephone interview. All participants provided written informed consent, and the study protocol was approved by the participating Institutional Review Boards.

BP Measurements

BP was taken by trained examiners using android sphygmomanometer. BP was measured twice after a standard protocol. All participants were asked to sit for 5 minutes with feet on floor before BP measurement, and there was a 30-second interval between measurements. The average of two readings was calculated. BP quality was monitored by central examination of digit preference and retraining of personnel as needed.

Definition of Groups Based on BP and Antihypertensive Treatment

We stratified the cohort into six mutually exclusive groups based on BP control and number of antihypertensive medications used. We defined normotension as SBP < 120 mm Hg and DBP < 80 mm Hg without antihypertensive medication use, prehypertension as SBP 120–139 mm Hg and/or DBP 80–89 mm Hg without antihypertensive medication use,¹² controlled HTN as SBP < 140 mm Hg and DBP < 90 mm Hg on ≤ 3 classes of antihypertensive medications,²³ uncontrolled HTN as SBP ≥ 140 mm Hg and/or DBP ≥ 90 mm Hg on none or < 3 classes of antihypertensive medications, controlled aTRH as SBP < 140 mm Hg and DBP < 90 mm Hg on ≥ 4 classes of antihypertensive medications, and uncontrolled aTRH as SBP ≥ 140 mm Hg and/or DBP ≥ 90 mm Hg on ≥ 3 classes of antihypertensive medications.

AF Ascertainment

Details of AF ascertainment in REGARDS have been previously reported.²⁴ Briefly, baseline AF was determined using: (1) self-reported AF during computer-assisted telephone surveys based on history of physician diagnosis of AF and (2) ECG obtained during in-home visit that was centrally read by electrocardiographers blinded to clinical data.

Covariates

Demographics included age, race, and sex. Geographic regions of stroke prevalence (stroke belt, stroke buckle, and nonbelt) were also included. Measures of socioeconomic status included annual household income ($< \$35,000$ or $\geq \$35,000$) and highest level of education attained (less than high school, high school completion, or higher). Cardiovascular risk factors included exercise (any

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