

Research Article

Gender, race, age, and regional differences in the association of pulse pressure with atrial fibrillation: the Reasons for Geographic and Racial Differences in Stroke study



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Manuscript received February 25, 2016 and accepted May 28, 2016

Abstract

Pulse pressure (PP) has been associated with atrial fibrillation (AF) independent of other measures of arterial pressure and other AF risk factors. However, the impact of gender, race, age, and geographic region on the association between PP and AF is unclear. A cross-sectional study of data from 25,109 participants (65 ± 9 years, 54% women, 40% black) from the Reasons for Geographic and Racial Differences in Stroke study recruited between 2003 and 2007 were analyzed. AF was defined as a self-reported history of a previous physician diagnosis or presence of AF on ECG. Multivariable logistic regression models were used to calculate the odds ratio for AF. Interactions for age (<75 years and ≥75 years), gender, race, and region were examined in the multivariable adjusted model. The prevalence of AF increased with widening PP (7.9%, 7.9%, 8.4%, and 11.6%, for PP < 45, 45–54.9, 55–64.9, and ≥65 mm Hg, respectively, [*P* for trend <.001]) but attenuated with adjustment. No differences by gender, race, and region were observed. However, there was evidence of significant effect modification by age (interaction *P* = .0002). For those <75 years, PP ≥ 65 mm Hg compared to PP < 45 mm Hg was significantly associated with higher risk of AF in both the unadjusted and multivariable adjusted models (odds ratio = 1.66 [95% CI = 1.42–1.94] and 1.32 [95% CI = 1.03–1.70], respectively). In contrast, higher PP (55–64.9 mm Hg) among those ≥75 years was significantly associated with a lower risk of AF. The relationship between PP and AF may differ for older versus younger individuals. *J Am Soc Hypertens* 2016;10(8):625–632. © 2016 American Society of Hypertension. All rights reserved.

Keyword: Risk factor.

Pulse pressure (PP) is a surrogate measure of arterial stiffness, and both have been linked to cardiovascular disease (CVD) outcomes.^{1–7} Atrial fibrillation (AF) is the most common chronic cardiac arrhythmia in adults and is associated with adverse CVD events.^{8–10} In the United States, AF prevalence is expected to increase from 2.3 million currently to 5.6 million by the year 2050 and

thereby require more health care utilization irrespective of gender or race.^{8,11} In some studies, PP has been associated with new onset AF independent of other measures of arterial pressure and other previously recognized AF risk factors.^{12,13} In the Framingham Heart Study, each 20 mm Hg increase in the difference between systolic blood pressure (SBP) and diastolic blood pressure (DBP) was associated with a 24% increase in the risk of developing AF, even after adjusting for average arterial pressure and AF risk factors.¹² Elevated PP is associated with increased aortic stiffness which increases with age and appears to be modifiable.^{14,15} These findings suggest that PP may represent a potentially modifiable risk factor, and that lifestyle modifications, including weight loss, exercise, salt reduction, moderate alcohol consumption,¹⁶ or therapy aimed specifically at reducing or limiting the increase in PP with

Financial disclosure: none.

Conflict of interest: none.

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advancing age has the potential to reduce the substantial and rapidly growing incidence of AF in our aging society.

Studies that have addressed the risk of AF in African Americans (AAs) suggest that they have a lower prevalence of AF compared to whites, despite higher prevalence of AF risk factors. This is referred to as the AF paradox, and no good explanation has been elucidated, although detection bias, survival bias, and differential susceptibility have been suggested.¹⁷ In the REasons for Geographic And Racial Differences in Stroke (REGARDS) study, the relative risk of AF in AA versus whites differed according to the approach to detect AF. Adding electrocardiographically detected AF to self-report diminished the association between race and AF.¹⁸ Our aim was to better understand if the AF paradox holds true when studying the association between PP and AF, or if this paradox could be explained by PP differences by race.¹⁸ Prior studies have shown that gender is related to risk of developing AF. AF prevalence increases with age, but after adjusting for AF risk factors including age, men compared to women had a 1.5-fold increased risk of developing AF.¹⁹ Furthermore, women develop AF at an older age than men and have high CVD risk once AF develops including greater rates of stroke and lower quality of life than men.^{20–23} Moreover, evidence from population studies that evaluated gender, race, age, or regional differences in the relationship between AF and PP in a cohort that includes a large number of AA and women is lacking. Therefore, we examined the cross-sectional association between PP and AF in the REGARDS study.

Methods

Study Population and Design

Details of the REGARDS study have been published previously.²⁴ Briefly, the REGARDS study was designed to understand mechanisms leading to regional and racial disparities in stroke mortality. The study over-sampled AA and residents of the stroke belt (North Carolina, South Carolina, Georgia, Alabama, Mississippi, Tennessee, Arkansas, and Louisiana). Between January 2003 and October 2007, participants were recruited from a commercially available list of residents using postal mailings and telephone data. Trained interviewers used a computer-assisted telephone interview system to obtain demographic information and medical histories. An in-home physical examination including blood pressure measurements, electrocardiogram recording, information on medications, blood, and urine samples was performed 3–4 weeks after the telephone interview.

For this study, 5130 of the study's 30,239 participants were excluded because of missing baseline covariates ($n = 4372$) or participants missing AF data ($n = 702$). The remaining 25,109 participants were included in the final analysis (Figure 1).

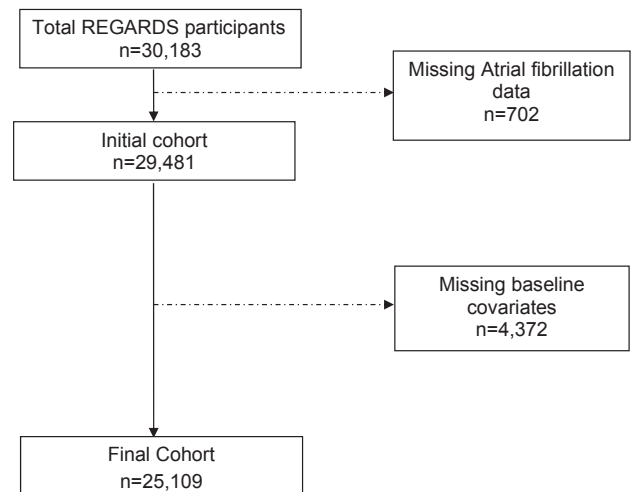


Figure 1. Exclusion cascade.

Pulse Pressure

Similar to other published studies, PP was divided into four groups: < 45 mm Hg, 45–54.9 mm Hg, 55–64.9 mm Hg, and ≥ 65 mm Hg.⁶ SBP and DBP were measured by trained technicians using an aneroid sphygmomanometer. The SBP and DBP were recorded as the average of two measurements taken according to the recommendations of the seventh Joint National Committee on Prevention, Detection, and Treatment of High Blood Pressure (JNC 7).²⁵

Atrial Fibrillation

Details on AF ascertainment have been published previously.²⁶ Briefly, AF was identified from a self-reported history of a physician diagnosis of AF obtained during computer-assisted telephone interview surveys and by the study-scheduled ECG recorded during the in-home visit that was then read centrally by trained ECG technicians blinded to the clinical data.

Covariates

Age, gender, race, income, education, region, alcohol habits, and smoking status were self-reported. Annual household income was dichotomized at \$35,000, and education was dichotomized as achieving at least a high-school diploma versus less than a high-school education. Cigarette smokers were categorized into never, past (at least 100 cigarettes in their lifetime), and current. Alcohol use was classified as heavy (>2 drinks/day for men and >1 drink/day for women), moderate (1 to 2 drinks/day for men and 1 drink/day for women), and none.²⁷ Hypertension was defined as SBP ≥ 140 mm Hg or DBP ≥ 90 mm Hg, respectively, or self-reported use of antihypertensive medications, which were classified according to the Medispan Therapeutic Classification system.²⁸ Vascular disease was defined as

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