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Jackson Heart Study: A Perspective at Ten Years

Michael G. Knight and Anne E. Sumner

Diabetes, Endocrinology and Obesity Branch of NIDDK, NIH, Bethesda, MD 20892, USA

Introduction

The Jackson Heart Study was established with the goal of reversing the epidemic of cardiovascular disease (CVD) in African Americans. CVD, encompassing both heart disease and stroke, is the leading cause of death and disability in the United States, and the CVD rate is higher in African Americans than whites. The prevalence of CVD is 45% in African American men, 47% in African American women, 38% in white men, and 34% in white women [1]. The disproportionately high rate of CVD in African Americans occurs even when socioeconomic and health insurance status are similar [2, 3]. To elucidate the reasons for the high CVD rate in African Americans, The Jackson Heart Study, modeled after the landmark Framingham Heart Study, was established.

In 1948, the Framingham Heart Study began in Framingham, MA with the random enrollment of two thirds of the residents in this eastern Massachusetts town. The original cohort consisted of 5,209 men and women. More than 98% of the participants were white. The cohort was evaluated prospectively, and subsequent generations were added: the Offspring cohort in 1971 and the Third Generation cohort in 2002 (<http://www.framinghamheartstudy.org>). From this extensive, prospective, multigenerational database, clear and convincing evidence of the dangers of high blood pressure, high blood cholesterol, and smoking were established. Therefore, data from the Framingham Heart Study has had a significant impact on health and environmental policy in the United States. In addition, using the original and offspring cohorts, a risk score for the prediction of CVD has been established and is known as the Framingham Risk Score [4]. Yet, even with the Framingham Risk Score, CVD mortality remains significantly higher in African Americans than whites. Hence, the need for a longitudinal study of CVD specifically focused on African Americans is clear.

To evaluate the epidemiology and pathophysiology of cardiovascular risk and disease in African Americans, the Jackson Heart Study began in 2000 in Jackson, MS. For several reasons, Jackson was an ideal location for a prospective study of CVD risk in African Americans. Mississippi has the highest rate of CVD in the nation [1]. Additionally, the African American community in Jackson was familiar with participation in prospective studies of CVD risk. Jackson residents had previously participated in the Atherosclerosis Risk in Communities (ARIC) study. The ARIC study was an investigation of the causes and progression of atherosclerosis. African Americans enrolled in ARIC were specifically recruited from Jackson. Therefore, from 1987 to 1988, 3,732 African Americans from Jackson aged 45 to 64 years participated in ARIC [5, 6]. The ARIC study not only

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A. E. Sumner DEOB, NIDDK, NIH Bld 10-CRC, Rm 6-5940, MSC 1612, 9000 Rockville Pike, Bethesda, MD 20892-1612, USA
AnneS@intra.nidk.nih.gov.

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established Jackson as a high-risk community, but also exposed the community to the benefits of clinical research. Therefore, the National Heart, Lung, and Blood Institute (NHLBI) and the National Institute for Minority Health and Health Disparities (NIMHD) chose Jackson as the site for the major prospective study of CVD in African Americans. The Jackson Heart Study was structured as a partnership between three institutions in Mississippi: the University of Mississippi Medical Center, Jackson State University, and Tougaloo College, with funding and active guidance from the NHLBI and NIMHD [7].

Aims

The Jackson Heart Study was designed with four main objectives.

Objective 1 was identification of CVD risk factors, and the prospective examination of their impact on disease development in African Americans through a single field site in Jackson, MS.

Objective 2 was the development of clinical research infrastructure in Jackson focused on the collection of epidemiologic data.

Objective 3 was enhancement of the communication between the University of Mississippi and the historically black institutions of Jackson State University and Tougaloo College.

Objective 4 was education of Jackson area minority students in the areas of medicine, public health and epidemiology [5].

Methods

The 5,301 Jackson Heart participants (ages 21–84) were recruited from the Jackson metropolitan area (Hinds, Madison, and Rankin counties) between 2000 and 2004. Approximately 30% of these individuals were previously enrolled in the Jackson arm of the ARIC study. At the time of recruitment for the Jackson Heart Study, the ARIC cohort consisted of approximately 3,000 African Americans aged 55 to 74 years. To include a broader age range, relatives of ARIC participants living in the Jackson metropolitan area, volunteers from the Jackson area, and community members were randomly selected [5, 7].

Between 2000 and 2004, medical history and physical examination, blood and urine analysis, and information on physical activity, stress, spirituality, discrimination, socioeconomic factors, and healthcare access were collected for all participants at the initial clinical exam (Exam #1). Following enrollment, follow-up clinical examinations are being conducted in 4 year cycles. Exam #2 was conducted from 2005 to 2008, and Exam #3 is being conducted from 2009 to 2012. In addition to clinic visits, telephone interviews are conducted annually to collect data on vital statistics, interim medical events, functional status, and sociocultural factors. To minimize loss to follow-up, surveillance methods are employed to adjudicate nonfatal events and death through the abstraction of medical records and death certificates [6].

Data collection and analyses are conducted at all three institutions, with each having a distinctly different role. The University of Mississippi Medical Center is the Clinical Field Center site and all medical interviews and examinations are held at this location. Data coordination and biostatistical analyses are performed at Jackson State University. Undergraduate training is provided at Tougaloo College, where a formal academic program exposes students to public health and epidemiologic training within the Jackson Heart Study research structure. NIMHD and NHLBI provide financial and technical support for the study

by funding and placing National Institutes of Health (NIH) field officers at study sites in Jackson [5].

Results

The 10th anniversary of the Jackson Heart Study was celebrated in September 2010. Over 60 publications with Jackson Heart Study data have been produced during the first decade of this study. We have identified three topics of special importance and review one publication from each area. The first article reviewed is one that provides clarification on the association between body size and CVD risk in African Americans. The second article describes the low rate of treatment of dyslipidemia in African Americans. The third, written by the authors of this review, demonstrates the opportunity provided by the Jackson Heart Study cohort to clarify the value of screening tests to identify CVD risk in African Americans.

The association between body size and CVD in African Americans has been debated for many decades. By comparing African Americans from the Jackson Heart Study with whites from the Framingham Heart Study, Taylor et al. [8] found that in all body mass index (BMI) categories, African Americans had a higher prevalence of diabetes, hypertension, and hypercholesterolemia. However, with increasing BMI, the prevalence of CVD risk factors rose faster in whites than in African Americans. Therefore, the association between obesity and CVD risk factors is actually stronger in whites than in African Americans. In addition, having a lean body composition does not protect African Americans from CVD risk.

Second, Taylor et al. [9] evaluated the disparity between the awareness of hypercholesterolemia and treatment of hypercholesterolemia in African Americans. Approximately 55% of Jackson Heart Study participants in the age range of 35 to 49 years were aware that they had hypercholesterolemia, but only 23% were receiving treatment. In the age range of 50 to 64 years, approximately 60% were aware that they had hypercholesterolemia but only 47% were receiving treatment. These results document the disparity between awareness and treatment, thereby highlighting the need for better identification and treatment of hypercholesterolemia in African American communities [9].

Third, the early diagnosis of CVD risk factors, such as insulin resistance, is necessary for successful CVD prevention. Effective screening tests are important as they allow for intervention at a time when early treatment could improve outcome [10]. However, many screening tests are developed in white populations and then applied to other groups without documenting efficacy. Particularly problematic is the triglyceride/high-density lipoprotein cholesterol (TG/HDL-C) ratio [11]. The TG/HDL-C ratio has been recommended as an inexpensive and effective tool to identify insulin resistance [12]. However, due to race and sex differences in both TG and HDL-C levels, thresholds determined in studies that did not take into account both race and sex could lead to misdiagnosis [12]. The current recommendation is that a TG/HDL-C threshold of 2.0 be used for all African Americans independent of sex [13]. Due to the size of the Jackson Heart Study, we were able to examine the ability of the TG/HDL-C ratio to identify insulin resistance in men and women separately. From the Jackson Heart Study cohort, we found that the best threshold for the identification of insulin resistance by the TG/HDL-C ratio for African American men was ≥ 2.5 . Therefore using the lower threshold could lead to over-treatment without an outcome benefit. For African American women, no threshold of the TG/HDL-C ratio could reliably identify insulin resistance. This was true even when pre- and post menopausal women were studied separately. Therefore, by having the opportunity to access Jackson Heart Study data, we were able to demonstrate that the TG/HDL-C ratio is not efficacious in African American women and suggest that valuable resources need to be invested in alternative diagnostic tools [11].

Comment

The Jackson Heart Study is a collaboration between African American residents of Jackson, three academic institutions, two NIH institutes, and the medical community, who together have accepted a mission of finding ways to reverse the epidemic of CVD in African Americans. Modeled on the success of the multigenerational prospective Framingham Heart Study, the Jackson Heart Study has the capacity and opportunity to positively affect cardiovascular and metabolic health in African Americans.

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