Stark Regional and Sex Differences in the Prevalence and Awareness of Hypertension

An H3Africa AWI-Gen Study Across 6 Sites in Sub-Saharan Africa

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ABSTRACT

Background: There is a high prevalence of hypertension and related cardiovascular diseases in sub-Saharan Africa, yet few large studies exploring hypertension in Africa are available. The actual burden of disease is poorly understood and awareness and treatment to control it is often suboptimal.

Objectives: The study sought to report the prevalence of measured hypertension and to assess awareness and control of blood pressure among older adults in rural and urban settings in 6 sites located in West, East, and Southern Africa. In addition, we examined regional, sex, and age differences related to hypertension.

Methods: A population-based cross-sectional study was performed at 6 sites in 4 African countries: Burkina Faso (Nanoro), Ghana (Navrongo), Kenya (Nairobi), and South Africa (Agincourt, Dikgale, Soweto). Blood pressure measurements were taken using standardized procedures on 10,696 adults 40 to 60 years of age. Hypertension was defined as systolic blood pressure $\geq$140 mm Hg or diastolic blood pressure $\geq$90 mm Hg or taking antihypertensive medication.

Results: The mean prevalence of hypertension ranged from 15.1% in Nanoro to 54.1% in Soweto. All 3 of the South African sites had a mean prevalence of hypertension of over 40.0%, significantly higher than in Nairobi (25.6%) and Navrongo (24.5%). Prevalence increased with age in both sexes and at all sites. A significantly higher prevalence of hypertension was observed in women in Agincourt, Dikgale, and Nairobi, whereas in Nanoro this trend was reversed. Within the hypertensive group the average proportion of participants who were aware of their blood pressure status was only 39.4% for men and 53.8% for women, and varied widely across sites.

Conclusions: Our study demonstrates that the prevalence of hypertension and the level of disease awareness differ not only between but also within sub-Saharan African countries. Each nation must tailor their regional hypertension awareness and screening programs to match the characteristics of their local populations.

Hypertension is a rising global health problem, with an estimated 1 billion people living with hypertension, and 9.4 million related annual deaths worldwide [1,2]. Low- and middle-income countries suffer two-thirds of the global burden of cardiovascular disease (CVD), which is associated with inadequate treatment of hypertension [3]. In sub-Saharan Africa (SSA) hypertension has become a major public health problem [4,5]. At present, CVDs are considered to be a significant contributor to premature death in this region, with a high prevalence of hypertension found in many SSA settings. The WHO-SAGE (World Health Organization Study on Global Ageing and Adult Health) study [6], which compared nationally representative populations over 50 years of age from China, Russia, India, Ghana, South Africa, and Mexico, reported that the prevalence of hypertension in South Africa was among the highest at over 77%. At the same time, the study reported low levels of awareness and blood pressure control in all of

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these countries [6]. In the absence of an effective intervention strategy to control this epidemic, it is expected that hypertension-associated CVD will continue to rise, with a concomitant increase in mortality and disability [7,8].

Despite global concerns over hypertension, there seems to be a dearth of information for most African countries on its prevalence, the levels of awareness by individuals on their blood pressure status, and how effective treatment is [9]. This is especially so in the population age group of 40 to 60 years of age, which is the age at which individuals suffer the highest levels of blood pressure—related disease [10,11].

The principal aims of the current study were therefore to measure the prevalence, level of awareness, and control of hypertension in a large population of 40- to 60-year-old participants of both sexes in 6 research sites across 4 SSA countries.

METHODS

This study draws on the Africa Wits-INDEPTH (University of the Witwatersrand, Johannesburg, and the International Network for the Demographic Evaluation of Populations and Their Health) [12] partnership for Genomic Studies (AWI-Gen), which is a National Institutes of Health—funded Collaborative Centre of the Human Heredity and Health in Africa (H3Africa) Consortium [13,14]. The primary aim of AWI-Gen is to study genetic and environmental factors that contribute to cardiometabolic disease in African populations. Six study sites in 4 SSA countries are involved in AWI-Gen: in South Africa the MRC/Wits Agincourt Health and Demographic Surveillance System Site (HDSS) [15], Dikgale HDSS [16], and the Soweto cohort located within the MRC/Wits Developmental Pathways for Health Research Unit [17]; in Kenya the Nairobi HDSS [18]; in Ghana the Navrongo HDSS [19]; and in Burkina Faso the Nanoro HDSS [20].

Study design and participant recruitment

This was a cross-sectional population study to serve as a baseline time point for adults between 40 and 60 years of age, who were recruited into the study between August 2013 and August 2016.

Participants who were recruited into the AWI-Gen study [21] were residents at 6 sites that span the African continent. In West Africa, these were the rural areas of Nanoro and Navrongo; in East Africa an urban informal settlement in Nairobi; and in South Africa, the rural areas of Agincourt in the province of Mpumalanga and Dikgale in the province of Limpopo, and the suburban township of Soweto that lies on the outskirts of Johannesburg. Pregnant women, first-degree relatives of existing participants, and individuals with physical impairments preventing measurement of blood pressure were excluded from the study. A resident was defined according to the HDSS criteria (staying within the area for at least 3 months and expecting to stay more than 3 months after the census).

Informed consent, and anonymization of participant identity

All participants provided written informed consent before any study procedures were conducted. Each participant was assigned a random AWI-Gen study participant identity code, which was used on study documentation, and the key linking participant identity and their identity code locked securely away at the research site, and not entered onto any further study documentation.

Measurement of blood pressure

Blood pressure was measured using a sphygmomanometer (Omron M6, Omron, Kyoto, Japan), according to the following standardized procedure: participants were seated upright in a chair, with feet resting firmly on the floor and not crossed. To ensure that the antecubital fossa was at the level of the heart participants were seated with the left arm resting on a desk or arm rest. The cuff was placed on the arm about 2 to 3 cm above the antecubital fossa, and not restricted by clothing. The participant was allowed to relax for 3 to 5 min before blood pressure was measured. Three measurements were taken, at 2-min intervals. During this period, participants remained quiet and still. The mean of the last 2 measurements was used to calculate the final systolic blood pressure and diastolic blood pressure.

Diagnosis of hypertension

Blood pressure measurements were classified according to the JNC7 guidelines of the Joint National Committee of Prevention, Detection, Evaluation, and Treatment of High Blood Pressure [22]. Hypertension was defined as presenting 1 or more of the following conditions: systolic blood pressure $\geq$140 mm Hg, diastolic blood pressure $\geq$90 mm Hg, or the participant reported that they were currently taking medication for hypertension.

Data collection and quality control

A paper questionnaire was administered to participants as part of a wider survey by the AWI-Gen study. This questionnaire asked for demographic information about the participant, as well as historical information about their blood pressure, previous diagnosis of hypertension, and how it was treated. Blood pressure data were also recorded on this questionnaire. These data were then entered into a REDCap (Research Electronic Data Capture) computerized database [23,24]. For quality control purposes, 10% of all entries were checked for consistency between the paper form and the electronic versions. Anonymized data were then transferred though a secure File Transfer Protocol connection to the central REDCap server at the University of the Witwatersrand, where a second process searched for outliers and missing data. Sites were requested to refer back to the paper forms for reconciliation.