

# **Propensity of people of African descent towards hypertension-associated cardiovascular pathologies**

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**Published as:** Hypertens Res. 2016 Sep;39(9):628-30. doi: 10.1038/hr.2016.69.

Epub 2016 Jun 16.

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Jansen van Vuren *et al.* in *Hyperpulsatile pressure, systemic inflammation and cardiac stress are associated with cardiac wall remodeling in an African male cohort: The SABPA study*<sup>1</sup> explored factors associated with cardiac wall remodeling in a bi-ethnic and bi-sex cohort of school teachers in South Africa. The median ages for the ethnic groups were 44 (Caucasian) and 47 (African) years. The factors unique to African males that were associated with cardiac wall remodeling were identified. Hypertension was more prevalent in Africans than in Caucasians (54 vs. 25%). Africans had more silent ischemic events and a higher degree of left ventricular hypertrophy. Inflammatory marker concentrations were significantly higher in the African cohort. Within the male cohort, Africans, following correction for covariates, had significantly more silent ischemic events, a higher degree of left ventricular hypertrophy, higher blood pressure measurements and more inflammatory markers than Caucasians. Similar differences were observed for the female cohort, with the exception of the number of ischemic events that did not differ significantly. The authors conclude that cardiac wall remodeling in African males is associated with hyperpulsatile pressure, low grade systemic inflammation and indices of ventricular stress.

The mechanism of cardiac remodeling in black Africans is explained as follows:

- TNF- $\alpha$  release induces apoptosis, promotes release of reactive oxygen species, and reduces nitric oxide generation. Increase in myocardial afterload results from the impairment of endothelium-dependent vasodilation, as well as from the concomitant excessive  $\alpha$ -adrenergic responsiveness, triggering cardiac remodeling.
- IL-6 gives rise to increased tissue factor and von Willebrand factor release, thereby increasing collagen deposition.
- Arterial stiffness increases owing to increased vascular wall permeability leading to an increase in ventricular transmural pressure and volume overload, which induces stretching of the myocytes and results in cardiac remodeling.
- Inactivity, smoking and alcohol use compound the insult of hypertension.

The novelty of this small study lies in its composite nature, where biochemical markers and cardiac indices represent ventricular challenges associated with hypertension. Ethnicity may be an important factor in predicting hypertension, which may evolve into cardiac failure or ischemic heart disease.<sup>2</sup> Findings linking ethnicity, hypertension, pro-inflammatory status or ventricular remodeling in systolic hypertension are not novel. What is interesting is that the higher frequency of silent ischemic events in African males was not associated with higher than expected (for black race or for

degree of ventricular strain) Troponin T (Trop T) and NT-proBNP concentrations. The significant relationship of NT-proBNP with TNF alpha, Troponin T and pulse pressure supports the construct that ventricular remodeling is related to both inflammation and myocardial ischemia in the presence of hypertension, as an African-specific phenomenon.

This commentary reflects on the magnitude of the rise in incidence of hypertension specifically in Africa, and the propensity of people of African descent towards hypertension-associated cardiovascular pathologies. Some additional comments are made on the diagnostic and prognostic usefulness of cardiac markers in hypertension-related cardiovascular disease resulting in morbidity and mortality.

#### *Rising incidence of hypertension in Africa*

Concern about the rapid increase in cardiovascular disease risk factors and hypertension, ultimately resulting in a higher prevalence of atherosclerosis and ischemic heart disease, in Sub-Saharan Africa has been raised. Deaths attributed to high systolic blood pressure have been estimated at 10.4 million for 1990-2013, and disability-adjusted life-years (DALYs) have been estimated at 208.1 million in the Global Burden of Disease Study 2013.<sup>3</sup> A high prevalence of hypertension and low percentages of hypertension awareness, treatment, and control were reported in a systematic review and meta-analysis assessing the burden of hypertension in Sub-Saharan Africa.<sup>4</sup> Studies published between 2000 and 2013 were included in the analysis, and identified 110,414 participants. Prevalence of hypertension was predicted at mean participant ages of 30, 40, 50, and 60 years, representing 16%, 26%, 35%, and 44%, respectively, and the overall prevalence was 30% (95% confidence interval, 27%–34%).<sup>4</sup> The relevance of this study,<sup>1</sup> performed in participants with similar socioeconomic status, is substantiated by the realization of covert risk factor and cardiovascular dysfunction prevalent in South Africans, and there are potential implications related to burden of cardiovascular disease in the continent of Africa.

#### *Hypertension-associated cardiovascular pathologies in Africans*

The Bogalusa Heart Study found that blood pressure variability, diet, salt intake, and other environmental effects had a greater damaging effect on the hearts of black Americans compared to Caucasian Americans owing to differing autonomic and metabolic responses to stress.<sup>2</sup> Support for ethnically-linked cardiometabolic differences is found in this South African cohort, which associates vascular responsiveness with ventricular distress expressed as hypertensive left ventricular structural changes and the number of silent ischemic events.<sup>5</sup> Although many abnormalities associated with hypertensive left ventricular hypertrophy are common to heart failure with

preserved ejection fraction (HFpEF),<sup>6</sup> hypertension as a cause of heart failure reportedly increased from 23% to 45% in the sub-Saharan Africa Survey of Heart Failure, whereas ischemic heart disease as a cause of heart failure increased from 2% to nearly 8%.<sup>7</sup>

#### *Diagnostic and prognostic usefulness of cardiac markers in hypertension-related cardiovascular disease*

Contrary to expectation, African participants had lower Trop T concentrations than Caucasian participants. Notably, the mean adjusted values for all 4 groups, differentiated by gender and ethnicity, were well above the detection limit of the assay (3 pg/mL). The 75th percentile value was 6.30 pg/mL for African participants and 8.63 pg/mL for Caucasian participants, whereas the 99th percentile cut point for the diagnosis of myocardial infarction is 14 ng/mL. Only 26.2% of the total study population had undetectable Trop T values. A general population study (Dallas County) found detectable Trop T concentrations in 34.4% (95% CI, 30.6%-38.3%) of black subjects and 25.4% (95% CI, 21.2%-29.0%) of Caucasian subjects in participants aged 40 to 50 years.<sup>8</sup> The authors conclude that Trop T, detected with a high-sensitivity method, “was associated with structural heart disease and subsequent risk for all-cause mortality”.<sup>8</sup> The contrast with the Jansen van Vuren study exemplifies the possible extent of cardiovascular disease risk for both South African ethnic groups. Furthermore, risk for progression of left ventricular hypertrophy to heart failure and cardiovascular death is implicated by Trop T and NT-proBNP levels above the age- and sex-specific 75th percentile of the population.<sup>9</sup> Both high-sensitivity Trop T and NT-proBNP are valid predictors of adverse events in the general population.<sup>10</sup> It is advisable that serial measurements of these biomarkers, among other indicators with adequate sensitivity, are employed for timely diagnosis and appropriate management of ventricular remodeling, independent of the presence of myocardial ischemia, when increases in blood pressure are detected in the general population.

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