Markers of arterial stiffness in people living with HIV and echocardiographic outcomes

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BACKGROUND

Cardiovascular disease (CVD) is a growing cause of morbidity and mortality in people living with HIV (PLWH). The population-attributable fraction of CVD associated with HIV now compares to that of diabetes and other traditional CVD risk factors in high-burden HIV regions. Arterial stiffness is an intermediate endpoint for CVD and a powerful predictor of future cardiovascular (CV) events and all-cause mortality. PWH may experience premature vascular aging with accelerated arterial stiffness occurring at younger ages than in HIV-uninfected adults, conferring elevated CVD risk We conducted a cross-sectional, comparative study of PLWH and HIV-uninfected community controls using multimodal assessment of arterial stiffness and echocardiographic outcomes. Specifically, we measured ankle-brachial index (ABI) as a marker of peripheral arterial stiffness, and pulse-wave velocity (PWV) as a marker of central peripheral stiffness.

METHODS

We performed ankle-brachial index (ABI) and pulse-wave velocity (PWV) to characterize arterial stiffness in a cohort of PLWH and HIV-uninfected community controls in Mwanza, Tanzania. Elevated ABI was defined as ≥ 1.3 and elevated PWV was defined as ≥ 9.0 m/s, both of which are associated with increased CVD risk. Simultaneous echocardiograms were performed to define cardiac outcomes including left-ventricular mass index (LVMI), left-ventricular hypertrophy, average e', and average E:e'. Multivariable logistic regression analysis was used to determine differential risk factors for ABI vs PWV and to determine associations between arterial stiffness and echocardiographic outcomes.

ADDITIONAL KEY INFORMATION

Funding was provided by the National Institutes of Health grants K24 HL170902 (RNP), R01 HL160332 (RNP), and D43 TW011826 (SF, EN, BI). The authors have no conflicts of interest to disclose. Data will be made available upon reasonable request.

HIV was associated with markers of peripheral but not central arterial stiffness. Peripheral arterial stiffness was associated with increased cardiac filling pressures.

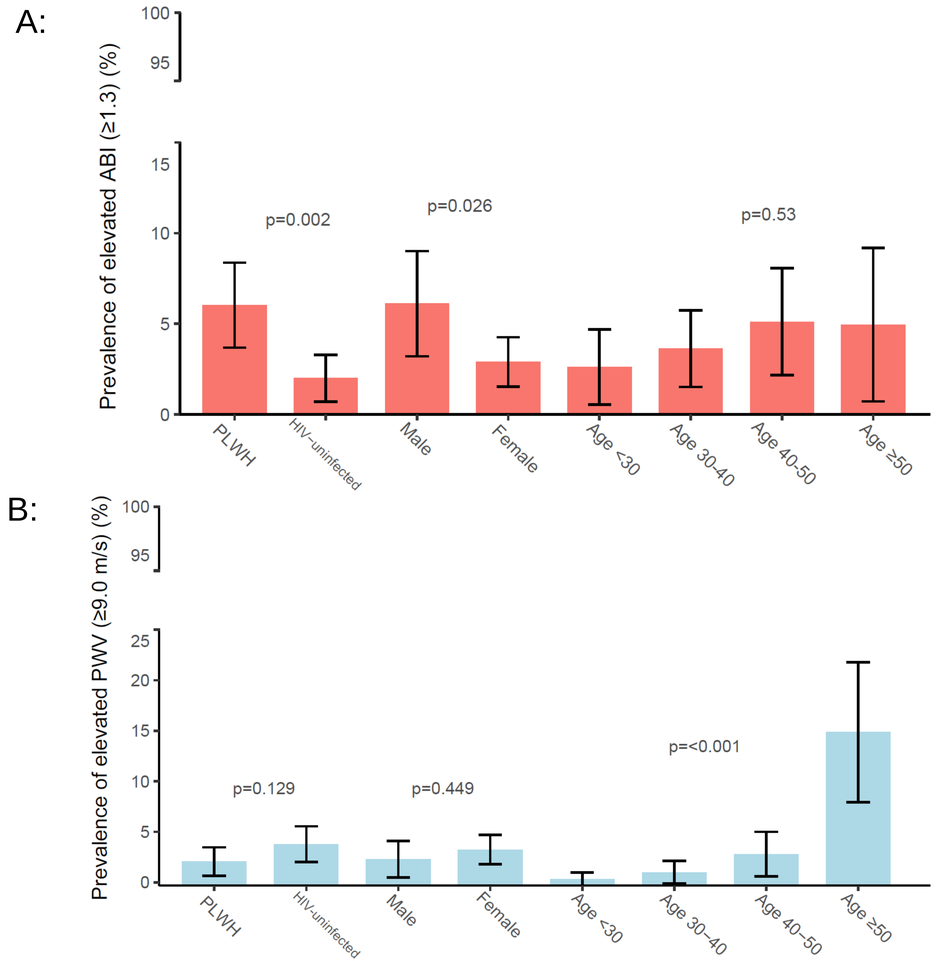


Figure 1: Prevalence of elevated ABI (Panel A) and PWV (Panel B), stratified by HIV status, sex, and age (n=848).

RESULTS

We enrolled 848 participants; 398/848 PLWH (46.9%) and 450/848 community controls (53.1%). Age and sex distributions were similar between the two groups. All PLWH were on anti-retroviral therapy (ART) with a mean treatment duration of 2.46 years (SD 0.92). In multivariable models, elevated ABI was associated with HIV infection (3.29 (1.51, 7.21), p=0.003), and male sex (2.33 (1.15, 4.71), p=0.019), whereas elevated PWV was associated with age (1.11 (1.06, 1.17), p<0.001), systolic blood pressure (1.58 (1.24, 2.01), p<0.001), and diastolic blood pressure (2.03 (1.38-2.98) p<0.001). ABI was independently associated with average E:e' (0.74 (0.18, 1.30), p=0.010). PWV was independently associated with left-ventricular mass index (LVMI) (10.73 (2.69-18.76), p=0.009). The average age of men with elevated ABI was 36.69 years (PWH: 36.07, HIV-uninfected community controls: 37.42).

CONCLUSIONS

PWH were more likely than HIV-uninfected comparators to have elevated ABI, but not elevated PWV. While both elevated ABI and PWV correlated with pathologic changes in cardiac structure and function, we found no participants with both elevated ABI and PWV. These results suggest that peripheral arterial stiffness is implicated in mechanisms of HIV-related cardiovascular disease. Risk factors for elevated ABI and PWV differed significantly: HIV infection and male sex were the strongest correlates of elevated ABI whereas older age and higher blood pressure were the strongest correlates of elevated PWV. Given the young age of our population, our ABI results suggest that young men with HIV in Sub-Saharan Africa may be at risk for undetected early vascular aging. Further research should investigate the burden of CVD in this population, with particular attention to undetected and delayed detection of disease.

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