Body Roundness Index and Incident Diabetes and Hypertension Among People with and at Risk for HIV

680

Grace L. Kulik[1], Weiqun Tong[2], Jing Sun[2], Todd T. Brown[3], James B. Brock[4], Gina Wingood[5], Audrey French[6], Frank J. Palella[7], Claudia Martinez[8], Andrew Edmonds[9], Phyllis C. Tien[10], Amanda B. Spence[11], Anjali Sharma[12], Kristine M. Erlandson[1], Jordan E. Lake[13]

[1]Department of Medicine, University of Colorado-Anschutz Medical Campus, Aurora, CO, USA; [2]Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA; [3]Deprtment of Medicine, Johns Hopkins University School of Medicine, Baltimore, MD, USA; [4]Department of Medicine, University of Mississippi Medical Center, Jackson, MS, USA; [5]Department of Sociomedical Sciences, Columbia University Mailman School of Public Health, New York. NY, USA; [6]Division of Infectious Disease, Stroger Hospital, Chicago, IL, USA; [7]Division of Infectious Disease, Northwestern University, Chicago, IL, USA; [8]Department of Medicine, Cardiovascular Division, University of Miami Miller School of Medicine, Miami, FL, USA; [9]Department of Epidemiology, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA; [10]Department of Medicine, University of California, San Francisco, CA, USA; [11]Division of Infectious Disease, Georgetown University Medical Center, Washington, DC, USA; [12]Department of Medicine, Albert Einstein College of Medicine, Bronx, NY, USA; [13]McGovern School of Medicine, University of Texas Health Science Center at Houston, Houston, TX, USA

BACKGROUND

- Persons living with HIV (PWH) may be pre-disposed to abdominal fat accumulation, which has profound consequences for cardiometabolic incidence.
- Common measures for assessing weight, such as body mass index (BMI), do not account for central adiposity.
- The body roundness index (BRI) was proposed in the general population to encompass central adiposity via inclusion of the waist circumference (WC) and height measurement.
- Given the high prevalence of central obesity among PWH, the purpose of this analysis was to evaluate the ability of the BRI to predict hypertension (HTN) or diabetes (DM) among people with or at risk for HIV.

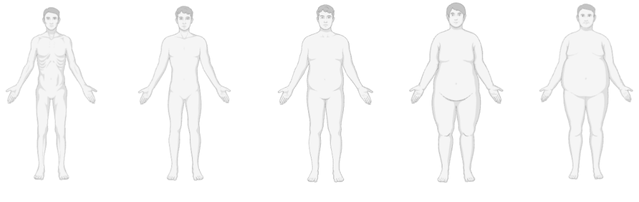
METHODS

- MACS/WIHS Combined Cohort Study (MWCCS) participants with >1 measurement of WC and height were included from 1999-2024. Participants were excluded if they were pregnant or had pre-existing HTN or DM, for the respective model.
- BRI was calculated as $364.2-365.5\times\sqrt{(1-[WC/2\pi]^2/[0.5\times height]^2)}$. BRI was divided into quintiles (Q1-Q5), with Q3 as the reference, from participants' first available BRI.
- Cox proportional hazard (PH) regression models were used to examine associations between BRI and incident DM and HTN. Models were adjusted for age, sex, race/ethnicity, smoking status, and HIV serostatus; stratified models by HIV serostatus were also performed. A time-to-event analysis was performed using baseline BRI. A Receiver Operating Characteristic (ROC) analysis was used to determine the discrimination ability of the BRI compared to BMI.

RESULTS

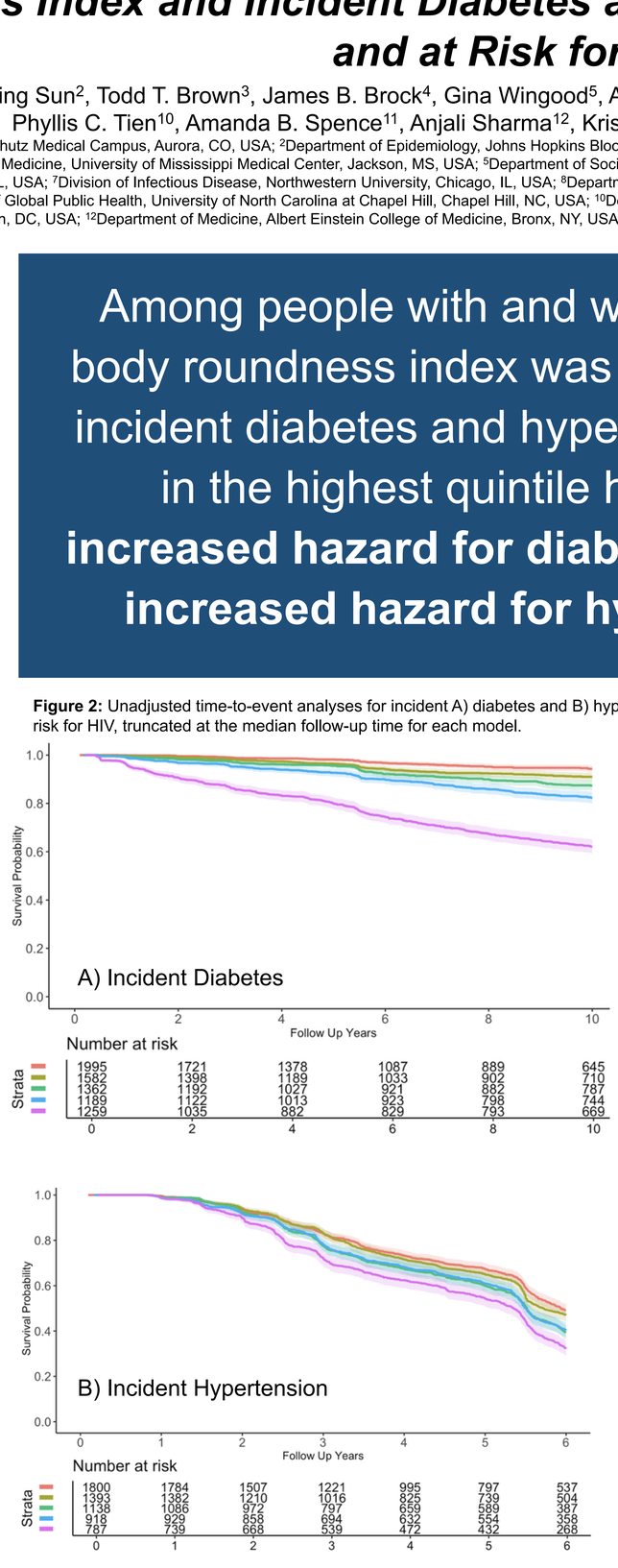
- Of 7,523 participants, the median [interquartile range] age was 41 [34, 49] years, 56% were female, 51% were Black, and 16% were Hispanic, with a median follow-up time of 10.1 years.

Figure 1: Visual depiction of the BRI quintiles established in the MWCCS population.



Among people with and without HIV, the body roundness index was associated with incident diabetes and hypertension. Those in the highest quintile had a 295% increased hazard for diabetes and a 44% increased hazard for hypertension.

Figure 2: Unadjusted time-to-event analyses for incident A) diabetes and B) hypertension among people with and at risk for HIV, truncated at the median follow-up time for each model.

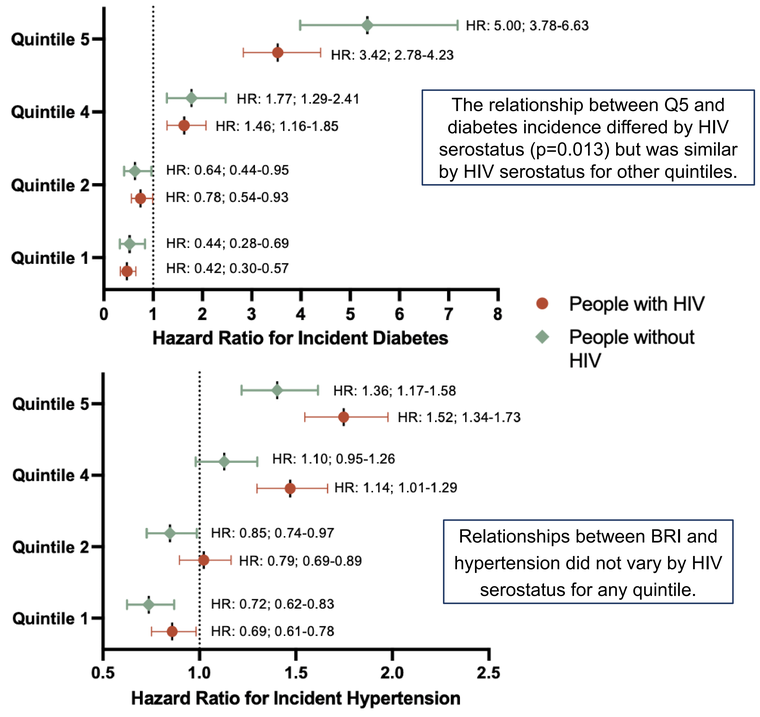


Q1: 58.0% reduction (HR: 0.43; 0.33-0.55)
Q2: 30.5% reduction (HR: 0.69; 0.56-0.87)
Q3: *ref.*
Q4: 55.2% increase (HR: 1.55; 1.30-1.87)
Q5: 295.0% increase (HR: 3.95; 3.33-4.67)

Q1: 30.0% reduction (HR: 0.70; 0.64-0.77)
Q2: 20.0% reduction (HR: 0.80; 0.73-0.88)
Q3: *ref.*
Q4: 12.0% increase (HR: 1.12; 1.02-1.23)
Q5: 44.0% increase (HR: 1.44; 1.31-1.60)

Table 1. Hazard ratios and 95% confidence intervals from Cox PH models, adjusted for age, sex, race/ethnicity, smoking status, and HIV serostatus. BRI, age, and smoking were modeled as time-varying.

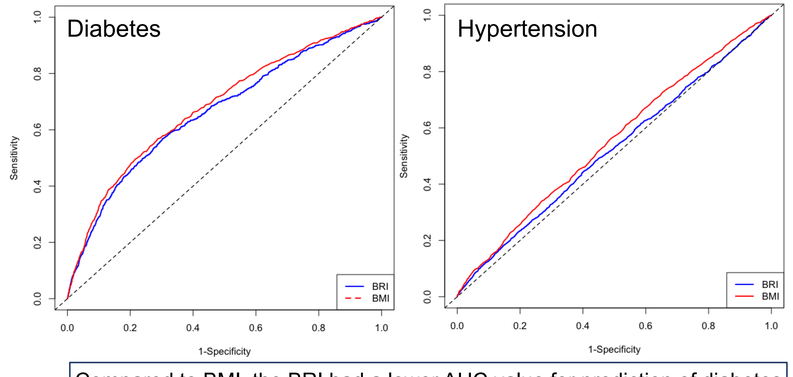
Figure 3: Hazard ratio (HR) estimates and 95% confidence intervals from Cox PH models, stratified by HIV status. Differences by status were assessed with an interaction term.



The relationship between Q5 and diabetes incidence differed by HIV serostatus (p=0.013) but was similar by HIV serostatus for other quintiles.

Relationships between BRI and hypertension did not vary by HIV serostatus for any quintile.

Figure 4: ROC analysis comparing BRI vs BMI at the median follow-up time for diabetes and hypertension.



Compared to BMI, the BRI had a lower AUC value for prediction of diabetes (BRI: 0.66 vs. BMI: 0.68; 95% CI: -0.024, -0.012, p<0.001) and hypertension (BRI: 0.52 vs. BMI: 0.55; 95% CI: -0.039, -0.026, p<0.001).

CONCLUSIONS

- Among people with and without HIV, BRI was associated with incident diabetes and hypertension, though BMI may have slightly better discrimination for these outcomes.