



Short communication

Cardiometabolic risk factors and cardiovascular disease predictions in older African and European Americans

Trudy Moore-Harrison^{a,*}, Kivana Keane^a, L. Jerome Brandon^b^a Dept. of Applied Physiology, Health and Clinical Sciences, University of North Carolina Charlotte, Charlotte, NC, USA^b Department of Kinesiology & Health, Georgia State Univ. Atlanta, GA, USA

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ABSTRACT

Cardiometabolic (CMO) risks factors do not provide similar cardiovascular disease (CVD) predictions in young African (AA) and European Americans (EA) adults. Whether CMO risk predictions contribute to this disparity in older adults is unclear. We hypothesize that older AA CMO clustering pattern will be different from EA clustering patterns when determine with non-fasting lipid and lipoproteins. The participants were 106 older adults (66 AA and 40 EA) from a working/middle class neighborhood (income \$46,364 – \$80,904) in an urban North Carolina community. The participants were evaluated for CMO risk factors (total cholesterol, high- (HDL) and low-density lipoproteins (LDL), triglyceride (TG), glycosylated hemoglobin (HbA1c), systolic –SBP- and diastolic blood pressures -DBP), body mass index (BMI), body fat % (BF%) and timed up and go test (assessed falls risk and physical function). The AA participants were heavier, had higher BMI, BF%, and timed up and go values ($p < 0.01$). The data were evaluated for differences (*t*-test) and Pearson correlations for relationships. If data differ by $p < 0.05$ the data were significantly different. The AA had a 17.6 % higher HDL (64.7 vs 55.1 mg/dL – $p < 0.05$) and 7.6 % higher HbA1c (5.8 vs 5.4 % – $p < 0.01$) than EA. Higher HDL values in EA indicate lower CVD risks. The HDL paradox for AA (AA had higher HDL values, but greater CVD risks) was observed and the HbA1c difference may be misleading, as similar glucose values in AA tend to have higher HbA1c values. Lipid, lipoprotein, and blood pressure was not different between the races. AA had higher body composition and HDL values. Although future research on this topic with larger samples, dietary data and detailed descriptions of participations medications is warranted to validate findings from this study. These data suggest older AA and EA adults with similar environmental conditions have similar CMO risks when measures with none fasting blood samples. Since AA have a greater prevalence of CVD, these finding suggests that population specific CMO risk factor clustering may be more effective predictors of CVD for AA.

1. Introduction

Cardiometabolic (CMO) risk factors and subsequently, cardiovascular disease (CVD) morbidity and mortality differ among racial and ethnic populations (Mitchell et al., 2019; National Center for Health Statistics (US), 2020). Self-identified African Americans (AA) experience an earlier onset, greater severity, and earlier mortality due to CVD than self-identified European Americans (EA) (Mitchell et al., 2019; National Center for Health Statistics (US), 2015). Possible reasons for the gap between AA and EA adults are lifestyle choices including physical activity participation, dietary choices, blood pressure control, stress management, and social environmental determinants (Mitchell et al., 2019; Li et al., 2014; Healy et al., 2015).

Previous studies have shown that insulin resistance (IR) is associated with low levels of high-density lipoprotein cholesterol (HDL) in EA (Marlatt et al., 2020; Deo et al., 2009). The lower levels of HDL and higher levels of low-density lipoprotein cholesterol (LDL) are contributors to CVD in EA. Although AA are more obese and experience more insulin resistance than EA, AA paradoxically have higher HDL and lower triglycerides (TG) levels when compared with EA. Despite the favorable lipid profile AA are two to four times more likely to experience CVD morbidity and mortality (Marlatt et al., 2020; Healy et al., 2015; Deo et al., 2009). This suggests that CMO risk factors predict AA differently than EA (Lee-Frye and Shah, 2022; Wilson et al., 1988).

Disease morbidities are often due to economic and social conditions such as built environment, health care access, health practices and

* Corresponding author.

E-mail address: tmoore2@unc.edu (T. Moore-Harrison).<https://doi.org/10.1016/j.pmedr.2022.102019>

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physical function that are less favorable among AA than EA. Obesity also has a differential relative effect on the pathogenic mechanisms underlying glucose homeostasis and atherogenesis in AA compared with EA (Carnethon et al., 2017; Nichols et al., 2017). African Americans frequently have a greater prevalence of obesity while being metabolically healthy (they have fewer CMO risks). Obesity increases CMO risks, but the number and clustering of CMO risks varied by age and race in middle-aged adults (Marlatt et al., 2020; Carnethon et al., 2017).

With a life expectancy of older adults rising, there has been increasing emphasis on maximizing the quality of life, including maintenance of physical function. The timed-up-and-go test is frequently used to estimate physical function. Maintaining or improving physical function can have beneficial effects on cognitive function and cardiovascular health (Metti et al., 2018). Also, the percent of hemoglobin saturated with oxygen contributes to physical function and health as average percent saturation is between 95 % and 100 % are necessary to prevent hypoxia (Pulse Oximeter Accuracy and Limitations, 2022).

Traditionally, fasting cholesterol profiles are used for CVD risk assessment with Friedewald-calculated LDL from measured HDL and TGs (Wilson et al., 1988; Farukhi et al., 2020; Nordestgaard et al., 2016). Recently non-fasting lipid screening has become accepted as a suitable alternative to fasting tests for routine screening. Several studies show that non-fasting TG levels are equally or even more strongly associated with CVD endpoints than fasting TG (Wilson et al., 1988; Farukhi et al., 2020; Nordestgaard et al., 2016). To date, there is no sound scientific evidence as to why fasting should be superior to non-fasting when evaluating a lipid profile for cardiovascular disease risk predictions (Nordestgaard et al., 2016; Grundy et al., 2019; Langsted and Nordestgaard, 2019).

Although not measured in a fasting state, the glycosylated hemoglobin (HbA1c) test is a more stable measure of blood glucose over time (Sophia et al., 2012). The HbA1c test does not require overnight fasting and compared to the fasting plasma glucose test, is less complicated to administer and can be less prone to error. Yet, caution should be used when glucose is estimated from HbA1c as higher HbA1c levels are observed in AA than in EA for similar levels of glucose (Sophia et al., 2012; Wallace et al., 2020).

In a study with AA and EA adults; AA, older age, female, lower systolic blood pressure, higher diastolic blood pressure, greater BMI, higher fasting glucose, and higher HOMA-IR were all independently associated with higher HbA1c ($p < 0.05$) (Herman et al., 2007). The HbA1c test measures the percentage of your red blood cells that have glucose-coated hemoglobin. It is unclear if HbA1c disparity stems from racial differences in pre- or postprandial glycemia, the tendency of hemoglobin to undergo glycation, erythrocyte turnover, or erythrocyte permeability to glucose (Farukhi et al., 2020; Nordestgaard et al., 2016).

The greater CVD prevalence in AA compared with EA may be due to race, environment, culture, and age. More AA are obese which affects other CMO risk factors in AA different from in EA (Marlatt et al., 2020; Deo et al., 2009). This suggests that CMO risk factors provide different information about the risk of CVD in AA and EA adults. Whether or not a similar prevalence of CVD is predicted by CMO risk factors in older AA and EA adults is not clear and needs further elucidations (Marlatt et al., 2020; Healy et al., 2015; Deo et al., 2009). Therefore, the purpose of this paper was to determine if CMO risk factors respond in similar patterns and are similarly related with obesity based on race and physical function in older AA and EA adults with similar physical and environmental characteristics. A second purpose of this paper was to determine if non-fasting lipid and lipoprotein analyses would provide consistent outcomes for older AA and EA adults.

2. Participants and methods

A comparative research design was employed to determine if older AA and EA (age ranged from 65.0 to 80.0 years) would have similar CMO risk factors profiles. Continuous health and fitness programs

participants in selected neighborhoods produced a trend of CMO risk factors in AA and EA responding differently. Based on this observation and inconsistent differences observed in the literature, the authors decided to compare the participants based on race (Marlatt et al., 2020; Lee-Frye and Shah, 2022; Wilson et al., 1988). The participants were a convenient sample of 106 older adults (66 AA and 40 EA) from a working/middle class neighborhood (income \$46,364 – \$80,904) in an urban North Carolina community. The community composition was 41.1 % AA and 40.2 EA, did not have a food desert, 38.8 % had a bachelor's degree, the poverty level was 8 % to 12 % and 11.5 % of the community was 60 years of age or older.

The participants signed an institutional informed consent, completed a survey from which community composition was determined as height and weight were measured. The testing occurred between 9:00 am and 12:00 noon, required two hours to complete. The participants did not wish to fast before the testing, so they ate breakfast and were assessed an average of two hours after eating.

Participants were evaluated for CMO risk factors (total cholesterol, HDL, LDL, TG, HbA1c, systolic –SBP- and diastolic blood pressures –DBP), anthropometry (body mass index, and body fat percentage –BF%) and physical function (timed up and go). The relatively fit older adults participated in an ongoing university sponsored community center health and fitness programs where older adults visited two or more days a week for a minimum of six-months. When asked about medications they were taking, no one reported taking medications that were contraindicative to physical activity.

Blood pressure was measured twice with a 10-minute interval in between as participants sit relaxed in a chair with their legs uncrossed, feet flat on the floor and their back against the chair. The appropriate cuff was placed two centimeters above the elbow crease of the arm. A calibrated automated cuff measured blood pressure on one arm and a pulse oximeter placed on the index finger of the opposite arm measured O₂ saturation and resting heart rate. Blood profiles were completed via PTS Diagnostics PTS760 CardioChek Plus Analyzer (Kernersville, NC 27284) that measured complete lipid profile and glucose levels (LDL, HDL, TG, blood glucose, and glycosylated hemoglobin (HbA1c)). The technician wiped the area clean with an alcohol pad and dried the finger with a gauze pad. A small prick to the fingertip was made via a disposable lancet. The first drop was wiped with a gauze pad, then subsequent drops were collected onto a lipid strip on the CardioChek system and data were recorded. Pulmonary functions were assessed via spirometry as participants were instructed to inhale as deep as possible with lips sealed around the disposable mouthpiece and exhale as quickly and forcefully as possible until lungs were empty, and the system signaled. Forced vital capacity (FVC) and forced expiratory volume in one second (FEV₁) were recorded and FEV₁/FVC ratio was calculated.

Physical function was measured with an eight-foot timed up and go test. The participant was instructed to sit with feet flat on the floor and hands resting on their knees. Once the instructor says, “go,” the timer was started. The subject stood and walked quickly but comfortably, and without running, to and around the cone and back to the chair. Once completely seated the timer stopped. Two trials were completed and the best time of the two trials was recorded. An OMRON 510 Bioelectric Impedance Analyzer system (Hoffman Estates, IL) with height, weight, and gender entered assessed BMI and BF% (body composition variables). Participants were instructed to stand with their feet at shoulder width and arms held parallel to the floor during the test. The procedure required approximately 45 s.

Descriptive statistics measured means and standard deviations of the AA and EA participant. Independent t-tests determined if differences exist between the AA and EA for CMO and obesity risk factors. Pearson correlations ($p < 0.05$) evaluated if relationships among the different variables would be similar for EA and AA participants.

3. Results

The mean age of the participants was not different, but the age range of the AA were more heterogeneous than the EA. The AA participants' body weight was greater than the EA body weight ($p < 0.05$; Table 1). An estimation of the circulatory health was derived from percent saturation of blood with oxygen within acceptable range (95 %-100 %) for both populations.

Lipoproteins, lipids, and cholesterol were measured in a non-fasting state two hours post-prandial. Older AA had a 17.6 % higher HDL ($p < 0.05$) than the EA and paradoxically, a 9 % higher ($p > 0.05$) values for triglyceride than EA). Although the lipid and lipoprotein values were evaluated in a non-fasting state their values did not reach CVD risk levels. There were no differences ($p > 0.05$) between the races for LDL or TG, but AA had a trend toward lower LDL, higher HDL, and higher TG values (Table 1).

The glucose values for the two groups were identical ($p > 0.05$), but AA had 7.6 % higher HbA1c ($p < 0.05$). Neither glucose (<125 mg/dL) nor HbA1c (<7.0 %) values were at levels that constituted a risk of developing CVD disease. Although HbA1c values were statistically different, they would not be considered physiologically significant. SBPs were mild CMO risks for both AA and EA participants. DBP values were neither different nor risk factors. The BF% for the AA was 40.7 % and BMI was 30.6 kg/m² while the BF% for the EA was 35.5 % and the BMI 25.2 kg/m². Body weight and composition differences may have influenced the time up and go value, as the time for AA was 15.7 % slower than for EA participants.

Significant relationships ($p < 0.05$) among CMO risk factors followed

Table 1
Comparison of cardiometabolic risk factors, anthropometric and functional variables based on race in older adults from the same Environment.

Variables	African Americans N = 68	European Americans N = 40	Percent Difference	Probability Significance = $p < 0.05$
Age (yrs.)	71.2 ± 7.4	72.5 ± 5.4	2.0	0.37
Height (cm)	162.6 ± 8.9	159.3 ± 9.3	2.0	0.06
Weight (kg)	82.2 ± 18.7	67.2 ± 20.4	18.0	0.00
O ₂ Saturation (%)	96.8 ± 2.2	97.1 ± 1.5	0.3	0.38
Resting Heart Rate (#/min)	73.4 ± 14.0	71.9 ± 11.0	2.5	0.41
Total Cholesterol (mg/dL)	170.5 ± 44.8	166.4 ± 35.5	2.2	0.66
High Density Lipoproteins (mg/dL)	64.3 ± 22.3	55.1 ± 19.1	17.6	0.03
Low Density Lipoproteins (mg/dL)	84.4 ± 31.3	91.5 ± 27.2	8.9	0.23
Triglycerides (mg/dL)	131.1 ± 66.8	120.8 ± 43.8	9.0	0.36
Glucose (mg/dL)	111.7 ± 25.0	111.4 ± 21.6	0.0	0.97
HbA1c (%)	5.8 ± 0.71	5.4 ± 0.40	7.6	0.00
Systolic Blood Pressure (mm/Hg)	139.3 ± 19.4	141.3 ± 13.9	1.4	0.55
Diastolic Blood Pressure (mm/Hg)	73.4 ± 10.0	75.0 ± 8.8	2.0	0.43
Body Mass Index (kg/m ²)	30.6 ± 6.1	25.2 ± 5.8	21.4	0.00
Body fat (%)	40.7 ± 5.7	35.5 ± 8.4	15.2	0.00
Timed up and go (seconds)	6.7 ± 2.2	5.8 ± 2.6	15.7	0.00

mg = milligrams; dL = deciliters; mmol = micro moles; kg = kilograms; m² = meters square.

FEV1 = Forced expired volume in one second; FVC = forced vital capacity.

different patterns for AA and EA (Table 2). HDL, LDL, TG shared relationships in AA, but only HDL and LDL were related in EA. Glucose was related to HbA1c and BMI in AA, but only with BMI in EA. BMI was related to BF% and DBP in AA, but with glucose, BF% and time up and go in EA. Time up and go was related to HDL, TG, glucose, BMI, BF%, RHR and DBP in EA, but only BF% and DBP in AA.

4. Discussion

The purpose of this paper was to determine if CMO risk factors respond in similar patterns and were similarly related with obesity based on race and physical function in older AA and EA adults with similar physical and environmental characteristics. A second purpose of this paper was to determine if non-fasting lipid and lipoprotein analyses would provide consistent outcomes for older AA and EA adults.

Recently, non-fasting lipid screening is accepted as a suitable alternative to fasting tests for routine CMO screening (Nichols et al., 2017; Metti et al., 2018). Several population studies have shown that non-fasting TG levels are equally or even more strongly associated with CVD outcomes. Many countries are currently changing their guidelines for measuring lipid profiles for cardiovascular disease risk predictions to a non-fasting state as this simplifies blood sampling for patients, laboratories, and clinicians (Carnethon et al., 2017; Nichols et al., 2017; Wallace et al., 2020; Signs, 2017).

No significant differences ($p > 0.05$) existed between the races for LDL or TG, but AA had a trend toward lower LDL and higher TG values in this study. Lower HDL values and a trend toward higher LDL values in EA suggest that they are more likely to develop CVD (Signs, 2017). These findings along with the higher HDL values in AA reinforce the HDL paradox where AA have a less atherogenic profile, but a greater prevalence of CVD (Nicholls and Nelson, 2019; Montvida et al., 2020). Mixed findings for LDL, HDL and carbohydrates were observed when values from the current study were compared with other studies (Healy et al., 2015; Olson et al., 2010). The other studies observed that LDL, HDL and carbohydrate values were not different between the races, but EA has significantly higher TG values than the AA. Possible reasons for the difference between the current study and Healy et al. (Healy et al., 2015) study is that participants in Healy et al. (Healy et al., 2015) study were 44.8 years of age while participants in the current study were 71.7 years of age.

Glucose was not different for the AA and EA, but AA had higher HbA1c values. This finding is consistent with other results that reported a tendency for AA to have higher HbA1c at similar glucose levels compared with EA. Use of a uniform HbA1c CMO risk classification may result in a higher rate of false diabetes diagnosis in AA (Montvida et al., 2020; Olson et al., 2010). The older adults blood pressure did not differ based on race, however, SBP values were borderline hypertensive for both groups. This was different from another study which found that AA had higher blood pressure than EA (Lee-Frye and Shah, 2022) but participants were younger in that study. Although AA had higher HbA1c and a trend toward higher TG values, the findings of few CMO risk factors that differed from EA was surprising and may have been partially the results AA having higher HDLs (Ford et al., 2019).

Time up and go had a significant relationship only with BMI for EA and BF% for AA. Body fat was related only with BMI in AA but was related to BMI and TRIG in EA. Mean differences between timed up and go between AA and EA suggest EA are more functionally fit and may partially explain the CVD prevalence difference between the races (Wilson et al., 1988; Pulse Oximeter Accuracy and Limitations, 2022; Montvida et al., 2020; Olson et al., 2010).

5. Conclusion

The older AA were more obese, but other than obesity had CMO risk profiles somewhat similar to older EA. SBP was a CVD risk factor for each population group while AA had a favorable HDL profile and EA had

Table 2

Relationships among cardiometabolic risk factors, circulatory and body composition variables in older adults.

Variable	African Americans N = 68						Europeans Americans N = 40					
	BMI	BF%	LDL	TRIG	HDL	HbA1c	BMI	BF%	LDL	TRI	HDL	HbA1c
FEV1/FVC (ratio)	-0.09	0.17	-0.05	0.05	-0.11	-0.08	-0.02	-0.28	0.04	-0.15	0.25	0.04
Glucose (mg/dL)	0.33**	0.22	0.01	0.01	-0.18	0.38**	0.43**	0.25	-0.14	0.27	-0.25	0.06
Cholesterol (ml/dL)	0.07	0.17	0.77**	0.45**	0.47**	0.04	0.07	0.17	0.85**	-0.22	0.45**	0.04
RHR (#/min)	0.16	-0.05	-0.12	0.11	-0.28*	0.04	0.09	0.05	0.12	-0.09	0.12	-0.16
SBP (mmHg)	0.06	0.08	-0.20	-0.20	0.12	-0.10	0.04	0.12	0.05	-0.05	0.00	-0.28
DBP (mmHg)	0.29*	-0.14	-0.03	-0.18	0.14	0.01	0.29	0.25	0.21	0.22	-0.06	0.07
Timed up & go (sec)	0.22	0.32*	0.15	0.02	0.03	0.00	0.68**	0.49	-0.05	0.39	-0.33	-0.06
Body Mass Index kg/m ²)		0.62**	0.19	0.04	-0.23	0.20		0.73**	-0.00	0.64**	-0.17	0.21
Body Fat (%)	0.62**		0.10	0.11	0.05	0.23	0.73**		-0.13	0.51**	-0.38	-0.25

* significant at $p < 0.05$; ** significant at $p < 0.01$ BMI- body mass index; BF% - body fat percentage; LDL = low density lipoprotein cholesterol; TRIG- triglyceride; HDL = high density lipoprotein cholesterol; HbA1c (%) - glycosylated glucose; FEV1/FVC = forced expired respiratory volume in one second /forced vital capacity; SBP = systolic Blood Pressure; DBP diastolic blood pressure.

a favorable HbA1c profile. However, the HbA1c difference may be misleading, as similar glucose values in AA tended to have higher HbA1c values. Limitations of this study were the small number of participants, a lack of dietary data and lack of information relative to the medicines individuals were taking. Future research on this topic with larger samples, dietary data and detailed descriptions of medications participants are taking is warranted to validate findings from this study. These data suggest older AA and EA adults with similar environmental conditions have similar CMO risk factor profiles when measures with none fasting blood samples. Since AA have a greater prevalence of CVD, these finding suggests that population specific CMO risk factor clustering may be more effective predictors of CVD for AA.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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