Discrimination Is Associated with Elevated Cardiovascular Disease Risk among African Immigrants in the African Immigrant Health Study

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Background: African Americans and other persons of African descent in the United States are disproportionately affected by cardiovascular diseases (CVD). Discrimination is associated with higher CVD risk among US adults; however, this relationship is unknown among African immigrants.

Objective: To examine the associations among discrimination, resilience, and CVD risk in African immigrants.

Methods: The African Immigrant Health Study was a cross-sectional study of African immigrants in Baltimore-Washington, DC, with recruitment and data collection taking place between June 2017 and April 2019. The main outcome was elevated CVD risk, the presence of ≥3 CVD risk factors including hypertension, diabetes, high cholesterol, overweight/obesity, tobacco use, and poor diet. The secondary outcomes were these six individual CVD risk factors. The exposure was discrimination measured with the Everyday Discrimination Scale; summed scores ≥2 on each item indicated frequent experiences of discrimination. Resilience was assessed with the 10-item Connor-Davidson resilience scale. Logistic regression was used to examine the odds of elevated CVD risk, adjusting for relevant covariates.

Results: We included 342 participants; 61% were females. The mean (±SD) age was 47(±11) years, 61% had at least a bachelor's degree, 18% had an income <\$40,000, and 49% had lived in the US ≥15 years. Persons with frequent experiences of discrimination were 1.82 times (95%CI: 1.04–3.21) more likely to have elevated CVD risk than those with fewer experiences. Resilience did not moderate the relationship between CVD risk and discrimination.

Introduction

Cardiovascular disease (CVD) is the leading cause of death worldwide and in the United States. CVD and associated risk factors are of economic and public health significance.[1] African Americans and other persons of African descent in the United States are disproportionately affected by CVD risk factors.[1] Although CVD risk factors in Blacks have been relatively well-examined, less is known about Black ethnic sub-populations such as African immigrants.

African immigrants are one of the fastest-growing immigrant groups in the United States; increasing by 41%[2] between 2000 and 2013. Africans made up approximately 40% of the foreign-born Black population of which West Africans (37%) made up the largest group.[2] In 2015, an estimated 2.1 million African immigrants resided in the United States, comprising 5% of the US immigrant population.[2] Despite their growing presence as a Black ethnic minority group, African immigrants are understudied, and their data are often aggregated with African Americans.[3] Prior research has observed both worse[4] and better[5] CVD risk profiles in African immigrants compared with African Americans.

Discrimination is a psychosocial stressor that negatively impacts mental and physical health.[6] Blacks in the United States are more likely than their non-Black counterparts

Conclusion: African immigrants with frequent experiences of discrimination were more likely to have elevated CVD risk. Targeted and culturally appropriate interventions are needed to reduce the high burden of CVD risk in this population. Health care providers should be aware of discrimination as a meaningful social determinant of CVD risk. At the societal level, policies and laws are needed to reduce the occurrence of discrimination among African immigrants and racial/ethnic minorities. *Ethn Dis.* 2020;30(4):651-660;doi:10.18865/ed.30.4.651

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to report having more experiences of discrimination.[7] Among African Americans, higher levels of discrimination were associated with a higher age-adjusted incidence of hypertension, additionally higher stress from lifetime discrimination was also associated with a higher incidence of hypertenson.[8] An association has also been observed between higher levels of everyday discrimination and greater subcutaneous adipose tissue

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in African American men.[9] However, despite sharing similar physical characteristics, the experiences of African Americans may be distinct from African immigrants because of the experience of immigration in the latter.

Discrimination, especially in health care, has been shown to have negative effects on the physical and mental health of immigrants.[10] Foreign-born Blacks, including African immigrants, are less likely than African Americans to report experiences of discrimination;[11] however, their experiences of discrimination signifi-

cantly increase with longer length of US residence.[11] With longer stay in the United States, individuals may become more aware of their minority status, experience societal stress, and subsequently perceive more discrimination.[12] African immigrants may perceive discrimination differently from African Americans because of their immigrant and acculturation status.[13] However, the association between discrimination and CVD risk factors among African immigrants is unclear.

Resilience, the ability to resist, recover, or rebound after a mental or physical stressor or challenge, may attenuate the deleterious effects of stressors, such as discrimination, on physical and psychological health.[14] African immigrants have exhibited resilience as they have adapted to the Australian context.[15] Prior research examining resilience in African immigrants in the United States is sparce.[16,17] These studies have shown that resilience results from experiencing racial discrimination and moderates the relationship between acculturation and obesity.[17] However, to our knowledge, the relationships among discrimination, resilience, and CVD risk have not been studied in African immigrants.

Thus, we examined the association between discrimination and CVD risk in African immigrants and examined resilience as a moderator of this relationship. We hypothesized that persons who report more experiences of discrimination would have higher CVD risk than those who experienced less discrimination. We also hypothesized that resilience would moderate this association.

METHODS

Study Participants

The African Immigrant Health Study (AIHS) was a community-based cross-sectional study examining the health of first-generation African immigrants. Using convenience sampling methods, participants were recruited from religious organizations in the Baltimore-Washington, DC metropolitan area. This area has the nation's densest concentration of African immigrants with more than 3.2% (193,849) of the population in the area being African immigrants. Of these, more than 40% are from Western Africa.[18] Faith-based institutions provide ethnic minorities with a supportive and familiar environment and have been used successfully to recruit immigrants who are considered "difficult-to-reach."

Participants were eligible if they: 1) were aged ≥30 years at the time of recruitment; 2) self-identified as being born in Cameroon, Liberia, Ghana, Nigeria, or Sierra Leone (as these countries share some common linguistic, sociodemographic, historical, and political characteristics); 3) resided in the Baltimore-Washington, DC metropolitan area; and 4) were English speakers. Participants were excluded if they were pregnant or were born in the United States. Recruitment took place between June 2017 and April 2019. Data collection took place during this period after oral informed consent was provided and included self-administered structured questionnaires and physical measurements. Participants had the option of completing these online or via printed surveys prior to in-person data collection events where physical measurements were obtained.

Participants who were excluded from analysis included those missing data on discrimination (n=53), poor diet (n=52), high cholesterol (n=23), diabetes (n=17), tobacco smoking (n=5), overweight/obesity (1), and sex (1). This study was approved by the Johns Hopkins University School of Medicine Institutional Review Board.

Outcomes

Elevated Cardiovascular Risk

The main outcome of interest was elevated CVD risk. A summative measure of CVD risk was created using the count of the number of high-risk categories for six risk factors for CVD. These risk factors, based on the American Heart Association's (AHA) Life's Simple 7 (LS7) metrics, characterize ideal cardiovascular health and included four health factors: diabetes, high cholesterol, hypertension, and overweight/obesity and two health behaviors: self-reported smoking, and diet quality.[19] Physical activity, the seventh LS7 component, was not included in this study due to a large amount of missing physical activity data (n=218). The score for CVD risk was dichotomized into three or more (≥3) and <3 CVD risk factors. The cut-point of 3 was used because having ≥3 CVD risk factors is associated with a 10-fold increase in CVD risk and mortality.[1]

Cardiovascular Disease Risk Factors

We also assessed the following CVD risk factors individually as secondary outcomes: hypertension, diabetes, high cholesterol, overweight/obesity, and poor diet quality. We did not examine tobacco smoking status

in this analysis because only two participants reported being current smokers. Hypertension status was assessed by measured blood pressures and classified based on the Seventh Report of the Joint National Commission on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) over the Eighth Report of the Joint National Commission on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 8) and the newer 2017 American College of Cardiology/American Heart Association (ACC/AHA) Hypertension classification. We used the JNC 7 criteria for hypertension classification as these guidelines were in effect when data collection was initiated. Blood pressure measures were obtained with an Omron 10 Series BP786N automatic blood pressure monitor, and assessments were interspersed with one-minute rests between measures. The average of the last two of three serial blood pressures was calculated. Per the JNC 7 guidelines, a participant was determined to be hypertensive if they had a systolic blood pressure measurement ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg[20] or were taking an antihypertensive medication due to a hypertension diagnosis by a health care provider.

Diabetes was defined by the respondent's response to the question: "Have you ever been told by a doctor or other health professional that you have diabetes or sugar diabetes?" We dichotomized responses as "Yes" or "No." Similarly, high cholesterol was defined using participants' responses to the question: "Have you ever been told by a doctor or other health care professional that you

have high cholesterol?" We dichotomized responses as "Yes" or "No."

Overweight/obesity status was classified based on body mass index (BMI), calculated using height and weight, measured without shoes. Height, in inches, was measured with a SECA° 216 portable stadiometer; weight, in pounds, was measured with a SECA° Robusta 813 scale. The BMI categories were defined as normal weight (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²) and obese (≥30 kg/m²). BMI was also dichotomized into normal (<25 kg/m²) vs overweight/obesity (≥ 25 kg/m²).

Dietary pattern was assessed with modified core diet questions from the World Health Organization STEPwise Approach to Surveillance (WHO STEPS) questionnaire.[21] Persons whose self-reported daily fruit and vegetable intake was ≤4 servings met the poor diet quality criteria designation per AHA and WHO recommendations.[22] Persons who responded affirmatively to questions on current tobacco smoking status were classified as current smokers.

Independent Variable

Perceived discrimination was the independent variable and was assessed using the 9-item Everyday Discrimination Scale (EDS); this instrument has exhibited good validity and reliability in diverse populations.[23] Details about the measurement and scoring of this instrument have been described elsewhere.[7] Briefly, responses ranged from 0 "never" to 3 "almost every day." As in prior research,[24] participants who scored ≥2 on each item (experienced discrimination often or sometimes) were categorized as having frequent

experiences of discrimination. Scores <2 on each item (experienced discrimination rare-to-never) were categorized as fewer experiences of discrimination.

Moderator

Resilience was measured using the 10-item Connor-Davidson Resilience Scale (CD-RISC 10).[25] This instrument has been used in diverse populations, including Africans and has demonstrated good validity and reliability with Cronbach alphas ranging from .75[26] and .93.[27] Scores on the instrument ranged from 0 to 40 with higher scores indicating more resilience. The CD-RISC 10 demonstrated high reliability (Cronbach's α=.92) in this sample. Resilience is typically examined in tertiles, representing low, medium, and high resilience[27]; however, due to the relatively small sample size, we chose to dichotomize resilience. Participants who scored ≥30 (the median) on the CD-RISC-10 were classified as having high resilience, and otherwise, low.

Covariates

Other covariates examined included age, sex, income, length of US residence, education, employment status, and acculturation strategy. The sociodemographic characteristics were assessed with the modified WHO STEPS.[21] Acculturation, measured using a modified version of the 10-item Psychological Acculturation Scale (PAS) developed by Tropp and colleagues,[28] assessed individuals' psychological responses to different cultural contexts. This validated instrument has been used in prior studies examining African immigrants in both the Netherlands (Moroccans)[29] and the US (Ghana-

ians and Nigerians)[30] and has been found reliable with Cronbach alphas ranging from .73-.94.[29,30] Items were rated on a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree" to identify four acculturation strategies: Traditionalist (identifies more with African than American culture); Integrationist (identifies equally with African and American cultures); Assimilationist (identifies more with American than African culture); and Marginalist (identifies with neither culture).[31]

Statistical Analysis

Independent sample Student's *t*-tests and Chi-square (χ^2) tests were used to examine differences in the sociodemographic characteristics and CVD risk factors. Continuous data were reported using mean, ± standard deviation for normally distributed data and median and interquartile ranges for skewed data. Categorical data were summarized using frequencies and percentages.

To examine the relationships between discrimination, elevated CVD risk, and the CVD risk factors, we fitted separate logistic regression models for the elevated CVD risk and each CVD risk factor. Model 1 was unadjusted, Model 2 was adjusted for age and sex, for Model 3, we added income, education, insurance status, and length of stay to the covariates adjusted in Model 2. In Model 4, the full model, we added marital status and a routine place for health care to the covariates we adjusted for in Model 3.

The interaction of discrimination and resilience was included in Model 1 to examine the moderating effect of resilience on the CVD risk factors

and elevated CVD risk separately. As the interaction term was not significant in our interaction models, it was not included in the final multivariable logistic regression models. The results of the analyses were considered statistically significant at a two-sided alpha (α) level of .05. All data analysis was performed with Stata IC14° (Stata Corporation, College Station, Texas).

RESULTS

Sociodemographic Characteristics

This study yielded an analytic sample of 342 participants after excluding participants for missing data on key measures. Females made up 61% of the sample; 38% (131) were born in Nigeria, 31% (105) in Ghana, 13% (45) in Cameroon, 13% (43) in Liberia, and 5% (16) in Sierra Leone. The mean (±SD) age was 47 (±11) years with 18% (60) being aged ≥60 years; 61% (208) had an education level at a bachelor's degree or higher. Eighteen percent (61) of the participants had an income of <$40,000, 61% (209) had health insurance coverage, and 43% (147) had lived in the United States for at least 15 years. Reasons for moving to the United States included: joining family or marriage (31%); education (20%); job opportunities (13%); and for asylum or economic hardship (8%). The acculturation strategies participants employed were Traditionalists (43%), Integrationists (32%), Marginalists (22%), and Assimilationists (4%). Sociodemographic characteristics of the participants, stratified by discrimination frequency are found in Table 1.

Psychosocial Characteristics

The median (interquartile range [IQR]) perceived discrimination score was 8 (2, 12). More than half (58%) of the participants reported having frequent experiences of discrimination. There were no sex differences in the mean perceived discrimination (8.1 vs 7.2; P=.18). Persons who had frequent experiences of discrimination were more likely to be older on average (OR: 1.03; 95%CI: 1.01-1.05) and adopted the Traditionalist acculturation strategy (OR: 1.75; 95%CI: 1.25-2.46). There were no significant differences in frequently perceived discrimination by age (OR 1.02; 95%CI: 1.00–1.04; P=.08) or length of US residence (OR: 1.32; 95%CI: .84–2.08, P=.22). Discrimination was negatively associated with resilience (OR: .96; 95%CI: .93-.99, P=.01).

Participants had high resilience scores overall; the median (IQR) resilience of the sample was 30 (28, 36). A large proportion (68%) endorsed high resilience and there were no differences in resilience by length of US residence (OR: .68; 95%CI: .42 -1.09; P=.11). Integrationists were less likely to report frequent discrimination than Traditionalists (OR: .49; 95%CI: .30–.82); however, there were no significant differences in the odds of frequent discrimination among the other groups. There was no association between resilience and each of the CVD risk factors.

Cardiovascular Disease Risk Factors

The mean systolic and diastolic blood pressures were 125.4 mm Hg and 82.1 mm Hg respectively. Table 2 provides details of the CVD risk factors by discrimination fre-

quency. Approximately 40% of the sample was diagnosed with hypertension per JNC 7 criteria and/or taking antihypertensive medications. Seventy-two percent (72%) of the participants reported a poor dietary pattern; they consumed less than the AHA recommended ≥4 servings of fruits and vegetables. Figure 1 shows the distribution of the 6 CVD risk factors by discrimination frequency.

The crude and adjusted associations between discrimination and each

of the CVD risk factors are presented in Table 3. In Model 1, persons with diabetes and high cholesterol had greater odds of frequent discrimination experiences. In Model 4, the full model, only high cholesterol was associated with frequent discrimination. We also examined the effect of resilience on the relationship between discrimination and the CVD risk factors. There was no moderation, by resilience, in the relationship between discrimination and the CVD risk factors.

Table 1: Sociodemographic characteristics of African immigrants in the African Immigrant Health Study stratified by discrimination frequency

Characteristics n (%)	Fewer (rare/never)	Frequent (often/ sometimes)	P
N = 342	n=146	n=196	
Age, mean (SD)	45.6 (10.8)	48.7 (11.0)	.01
Female	95 (65.1)	113 (57.7)	.16
Married/cohabitating	110 (75.3)	137 (69.9)	.27
Educational status			.28
< High school	7 (4.8)	5 (2.6)	
Some college	40 (27.4)	69 (35.2)	
Bachelor's degree	52 (35.6)	58 (29.6)	
Graduate-level degree	44 (30.1)	54 (27.6)	
Income			.06
≤ $39,999	24 (16.4)	37 (18.9)	
$40,000-$69,999	25 (17.1)	56 (28.6)	
$70,000-$99,999	31 (21.2)	37 (18.9)	
≥$100,000	53 (36.3)	53 (27.0)	
Employed	120 (82.2)	156 (79.6)	.53
Length of stay in the United States			.41
<5 years	32 (21.9)	42 (21.4)	
5-9 years	28 (19.2)	24 (12.2)	
10-14 years	17 (11.6)	24 (12.2)	
≥15 years	64 (43.8)	94 (48.0)	
Have health insurance	91 (62.3)	118 (60.2)	.59
Have a routine place for health care	120 (82.2)	149 (76.0)	.08
Country of birth			.16
Ghana	46 (31.5)	59 (30.1)	
Nigeria	65 (44.5)	66 (33.7)	
Liberia	13 (8.9)	30 (15.3)	
Sierra Leone	5 (3.4)	11 (5.6)	
Cameroon	17 (11.6)	28 (14.3)	
Acculturation style			.04
Traditionalist	53 (36.3)	93 (47.4)	
Integrationist	58 (39.7)	50 (25.5)	
Assimilationist	5 (3.4)	7 (3.6)	
Marginalist	30 (20.5)	46 (23.5)	
Resilience, mean (±sd)	31.5 (±7.3)	29.5 (±6.7)	.01

Table 2: Cardiovascular disease risk factors by discrimination frequency, n(%)

Cardiovascular Disease Risk Factors	Total	Fewer	Frequent	P
	N=342	N=146	N=196	
Hypertension[a]	133 (38.9)	50 (34.2)	83 (42.3)	.13
Diabetes	41 (12.0)	11 (7.5)	30 (15.3)	.029
BMI categories				.91
Normal weight	53 (15.5)	23 (15.8)	30 (15.3)	
Overweight/obese	289 (84.5)	123 (84.2)	166 (84.7)	
High cholesterol	79 (23.1)	24 (16.4)	55 (28.1)	.014
Current smoker	2 (0.6)	1 (0.7)	1 (0.5)	.83
Poor diet	247 (72.2)	109 (74.7)	138 (70.4)	.47
Poor/inadequate physical activity	34 (9.9)	12 (8.2)	22 (11.2)	.17

a. Hypertension, as defined by the Seventh Report of the Joint National Commission on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7) Criteria and/or taking medication for hypertension.

Elevated Cardiovascular Disease Risk

Approximately 41% of the participants had elevated CVD risk (≥3 CVD risk factors); 32% of those with fewer experiences of discrimination and 47% with frequent experiences. Compared with participants with low CVD risk, those with elevated CVD risk were more likely to be older (OR: 1.08; 95%CI: 1.05-1.11, P<.001), less likely to have a bachelor's degree or higher (OR: .59; 95%CI: .39–.90) and have a longer length (≥10 years) of US residence (OR: 2.40; 95%CI: 1.53 – 3.76; P<.001). However, acculturation style was not associated with elevated CVD risk (OR: .92; 95%CI: .43-1.12; P=.348). Resilience was also not associated with an elevated CVD risk (OR: .98; 95%CI: .95-1.02).

Persons who reported having frequent experiences of discrimination had significantly higher odds of elevated CVD risk (≥3 CVD risk factors) than persons with fewer experiences of discrimination in both the crude and adjusted models. These associations are presented in Table 3. Resilience did not moderate the association between discrimination and elevated CVD risk (P=.89).

Discussion

In this study of African immigrants, we observed a positive association between discrimination and elevated CVD risk and high cholesterol; this study adds to the literature on CVD risk and discrimination in African-descent populations. The results of studies examining discrimination and CVD risk factors in African Americans and other racial/ethnic groups are mixed.[32] Discrimination is thought to elicit coping responses that are more passive and may be associated with increased cardiovascular reactivity and subsequent CVD.[33] These passive coping responses such as self-distracting, stress eating, substance use, and disengagement may prove to be unhealthy and lead to the development of CVD risk factors. Coping strategies have been found to moderate the relationship between stressors such as discrimination and psychological and biological responses to stress.[33] We did not, however, measure coping strategies in this study.

We also observed a high burden of CVD risk factors and CVD risk score (≥ 3 CVD risk factors), where 46% had elevated CVD risk despite their relatively young age. More than 40% of the study participants reported being treated for hypertension or had blood pressures meeting the JNC 7 hypertension criteria. In sub-Saharan Africa (SSA), the leading CVD risk factor accounting for the highest disability-adjusted life years (DALYs) is hypertension, followed closely by poor dietary patterns.[34] More than 70% of the participants in this study reported consuming diets low in fruits and vegetables. This is consistent with a change in dietary pattern to a more Westernized diet that includes a higher intake of fat and sugar-sweetened beverages among sub-Saharan Africans[35] and is associated with urbanization and immigration to Western countries.[36] Overweight/obesity was the most prevalent CVD risk factor (84%) in this study and in prior research examining African immigrants.[4] The prevalence of overweight/obesity in our study exceeds the estimated prevalence in SSA (31%)[37] and non-Hispanic Blacks (76%) in the United States.[1] The high prevalence of overweight/obesity in this study group may be due to the adoption of a Westernized diet and higher levels of physical inactivity.

Regarding health care access, a lower proportion (61%) of participants in this study reported having current health insurance compared with 72% of African immigrants in the National Health Interview Survey.[38] These figures are both much lower than the age-adjusted prevalence of self-report-
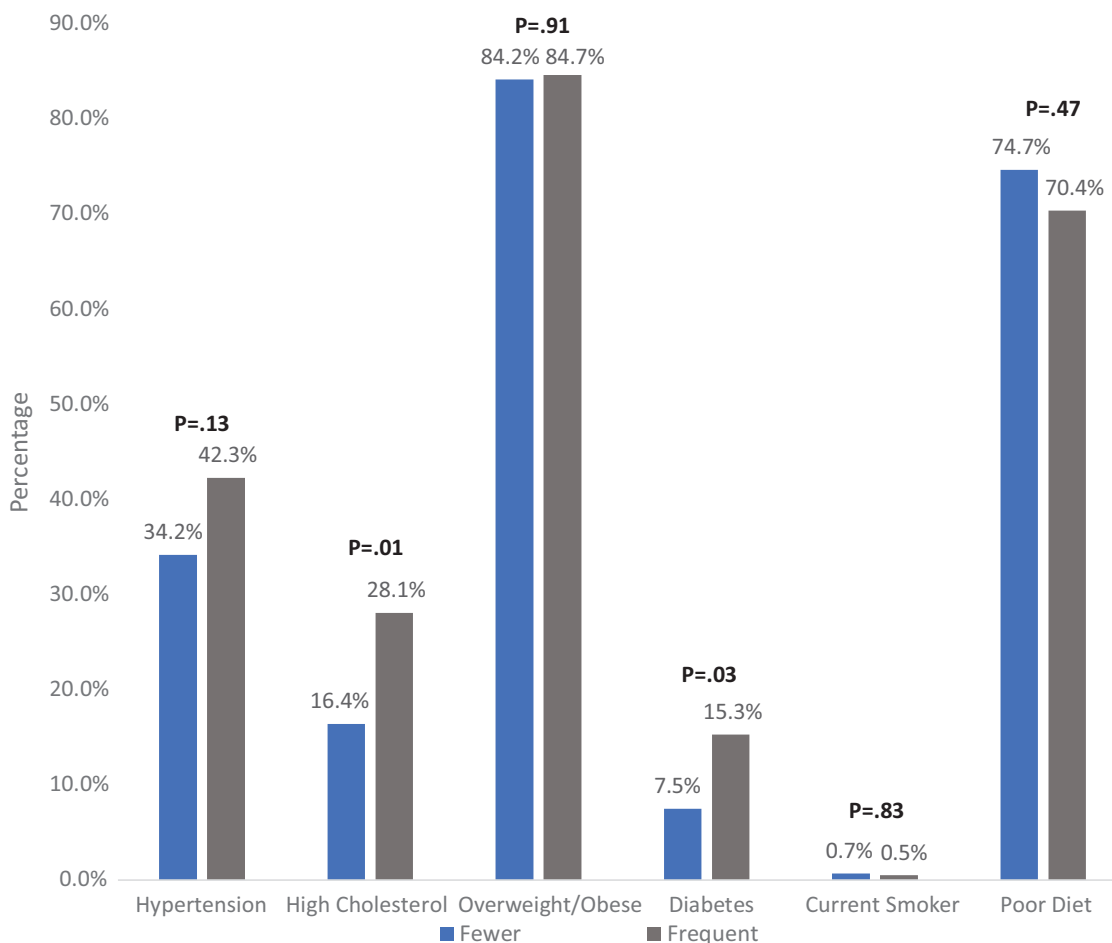
Figure 1. Distribution of CVD risk factors by discrimination frequency

ed insurance coverage of 94% and 95% among African Africans and in the general US population respectively.[39] Some African immigrants have a documented distrust of the US health care system,[40] and may delay seeking care, often until late in a disease process. One of the documented reasons for this distrust is discrimination they have experienced.[40] Immigrants from Africa in Europe have been observed to be more likely to forego health care and report more discrimination within health care than non-immigrants.[39] It is plausible that African immigrants in the United States may also forgo seeking health care for similar reasons; however, exploring these reasons was beyond the scope of study.

Participants in our study had a relatively high level of resilience (mean[SD]: 30.4 [6.9]), which is comparable to what has been reported (31.6 [7.8]) in a sample of African Americans with a history of exposure to high levels of adult and childhood trauma.[41] Immigrants may exhibit a high level of resilience because of the challenges they must overcome in their new environment due to the immigra-

tion process. African immigrants, for example, report building resilience by relying on their community or social network, religion, and culture for support.[16] In addition to the benefits that social support or having a strong social network provides, the collectivistic nature of the African culture provides a medium for coping among African immigrants.[42] Religion plays a significant role in fostering resilience among African immigrants who report finding strength and comfort through their religious beliefs.[43] In this study, the majority of data collection

Table 3: Relationship between discrimination and cardiovascular disease risk factors, N=342

Outcome	Model 1[a]	Model 2[b]	Model 3[c]	Model 4[d]
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Hypertension	1.41 (.90-2.20)	1.10 (.67-1.82)	1.01 (.58-1.76)	.89 (.50-1.59)
Diabetes	2.22 (1.07-4.61)[e]	1.88 (.89-3.97)	1.75 (.76-4.06)	2.25 (.87-5.82)
High cholesterol	1.96 (1.14-3.37)[e]	1.67 (.95-2.94)	1.74 (.91-3.31)	2.00 (1.01-3.97)[e]
Overweight/obesity	1.03 (.57-1.87)	.94 (.51-1.73)	0.88 (.45-1.71)	.98 (.48-1.97)
Poor diet	.81 (.45-1.45)	.75 (.41-1.36)	0.68 (.35-1.33)	.67 (.33-1.35)
Elevated CVD risk (≥3 CVDRF)	1.90 (1.22-2.97)[e]	1.61 (.99-2.61)[e]	1.69 (.99-2.90)[e]	1.82 (1.04-3.21)[e]

NOTE: Smoking was not included in this table due to the small number of smokers in the study (n=2), yielding imprecise estimates.

OR, odds ratio; CI, confidence interval; CVD, cardiovascular disease; CVDRF, cardiovascular disease risk factors.

a. Model 1: Crude association; no adjustments.

b. Model 2: Adjusted for age and sex.

c. Model 3: Model 2 plus income, education, insurance coverage, length of U.S. residence, and acculturation style.

d. Model 4: Model 3 plus, marital status, employment status, and routine place for healthcare.

e. Statistically significant at $P<.05$.

took place through religious organizations, thus the role of faith may have had an appreciable influence on participants' responses to the survey questions. However, religious beliefs and behaviors and their impact on resilience were not assessed in this study.

Acculturation is a stressful experience[44] and is associated with the development of CVD risk factors; however, the impact of resilience on acculturation is not fully understood. In this study, resilience did not moderate the relationship between discrimination and elevated CVD risk and was not associated with elevated CVD risk factor burden. In another study examining African immigrants, resilience moderated the relationship between acculturation and obesity.[17] However, resilience did not moderate the relationship between stress and incident CVD in a study examining Black women.[45]

Limitations and Strengths

This study has limitations and strengths that are worth considering. First, it is a cross-sectional study examining participants at only one point in time. No inferences, therefore, can be

made regarding causation, directionality, or the timing of the development of CVD risk. Second, CVD risk factors such as high cholesterol, diabetes, tobacco smoking, and dietary patterns were self-reported. Additionally, recruiting took place at religious organizations. These factors may have resulted in social desirability bias, sampling bias, and/or incorrect estimation of the prevalence of the CVD risk factors and psychosocial factors. Additionally, we did not collect information on coping strategies or follow-up details on the participants' perceived reasons for the discriminatory experiences due to increased participant burden. Future prospective studies among African immigrants should examine coping strategies for stressful situations, changes in CVD risk, discrimination, and resilience over time. Additionally, there is a need for studies that assess elements of structural discrimination to help elucidate the impact of structural discrimination in African immigrants.

Yet, this study has some notable strengths as it is unique in examining discrimination, resilience, and CVD risk factors in African immigrants. To

our knowledge, this study is the first to examine discrimination and CVD risk factors in African immigrants in the United States, thus filling a gap in the literature on resilience and discrimination in African immigrants. Participants in this study were a small, but diverse group of African immigrants from several different English-speaking countries in West Africa. Also, objectively measured blood pressure, weight, and height were used to create blood pressure and BMI outcomes.

CONCLUSION

Having frequent experiences of discrimination was associated with elevated CVD risk; persons who had frequent experiences of discrimination also reported a higher prevalence of ≥3 CVD risk factors, diabetes, and high cholesterol. Future research should include well designed longitudinal studies to determine whether causal relationships exist between discrimination and CVD in US-based African immigrants. Additionally, targeted, culturally appropriate interventions to

help decrease CVD risk in this population must be developed. Health care providers should consider psychological stressors including discrimination as potential contributors to CVD risk in this population. Additionally, health care providers in the United States are encouraged to incorporate tailored discrimination assessment and discussions regarding stress management and coping strategies into their plans of care when interacting with at-risk persons such as African immigrants. To decrease the impact of these negative experiences in African immigrants and racial/ethnic minorities, it is important to address discrimination and racism as a social determinant of health, classifying it as a public health and clinical priority and on the societal level, develop policies, legislation, context-specific interventions, and practice reforms to effect change.

Conflict of Interest

No conflicts of interest to report.

Author Contributions

Research concept and design: Turkson-Ocran, Szanton, Cooper, Golden, Ahima, Perrin, Commodore-Mensah; Acquisition of data: Turkson-Ocran, Commodore-Mensah; Data analysis and interpretation: Turkson-Ocran, Cooper, Ahima, Perrin, Commodore-Mensah; Manuscript draft: Turkson-Ocran, Szanton, Golden, Commodore-Mensah; Statistical expertise: Turkson-Ocran, Perrin, Commodore-Mensah; Supervision: Szanton, Cooper, Golden, Ahima, Commodore-Mensah

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