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Cardiovascular Health of HIV-infected African-American Women at the Miriam Hospital Immunology Center in Providence, RI

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Introduction

Cardiovascular Disease (CVD), which includes **coronary heart disease (CHD)** and stroke, is the leading cause of death for women in the United States. CVD is a particularly important problem among minority women because of increased prevalence, morbidity and mortality. The prevalence of CVD in African American females is 44.7 percent, compared to 32.4 percent in Caucasian females.[1] The morbidity and mortality due to CVD is substantially higher in African American women than in Caucasian women.[2] CVD is also a growing concern among **human immunodeficiency virus (HIV)** infected individuals.[3] CVD in HIV-infected patients has been associated with traditional CVD risk factors, such as hypertension, diabetes, smoking and dyslipidemia.[3] Age, genetics and family history are important non-modifiable cardiovascular risk factors. In addition, both HIV and antiretroviral therapy have direct and indirect effects on CVD risk.

Of the 1,220 new HIV cases diagnosed and reported to the Rhode Island Department of Health from January 1, 2000 – December 31, 2008; males accounted for 874 (72%) of the cases and females accounted for 346 (28%).[4] Although, African American women comprise 5% of the Rhode Island population, they account for the majority of HIV cases among women(39%), followed by Hispanic (29%) and Caucasian (27%).[4]

We performed this study to determine the cardiovascular health among HIV-infected African American women and to examine how well our HIV care providers screen and manage cardiovascular risk factors. In addition to reviewing screening and management practices, we wanted to determine if **American Diabetes Association (ADA)**, **American Heart Association (AHA)**, and **National Cholesterol Education Program (NCEP)** goals (for lipid level, hemoglobin A1c, blood pressure and smoking) were being met for HIV-infected African American women.

Methods

This was a cross sectional study conducted at the Miriam Immunology Center in Providence, the largest care provider for HIV-infected individuals in Rhode Island. The Institutional Review Board of the Miriam Hospital approved the study. The Miriam Immunology Center provided care to approximately 1,200 HIV-infected individuals in Rhode Island in 2008. African American women were defined as any non-Hispanic woman of African descent.

African American HIV-infected women to be included in this study were identified from the clinic electronic database and were included if they meet the following criteria: active patient at the clinic, defined as having seen an HIV care provider at least once during the 2008 calendar year, and at least 20 years of age, as this is the age that cardiovascular risk assessments should begin. Data were retrieved through electronic and written records.

In order to determine the overall cardiovascular health of HIV-infected African American women in the Miriam Immunology Center, we calculated a ten year risk for CVD, CHD, stroke, and **myocardial infarction (MI)** using **Framingham risk score (FRS)** for each patient. The Framingham score can be used as a surrogate marker of cardiovascular health and was developed as an instrument or as a risk assessment tool for determining risk of future cardiovascular vascular disease and cardiovascular events, myocardial infarction and coronary death. Although, the Framingham risk score has been noted to have several limitations in its applicability to women, African Americans, and HIV-infected individuals; D:A:D study investigators found that use of the Framingham risk score in HIV infected individuals may provide a reasonable approximation and is the best starting point available.[5]

For each modifiable cardiovascular risk factor we used established guidelines from the ADA/AHA/NCEP to assess appropriate rates of screening. For example, family history of cardiovascular disease should be regularly updated. Smoking status, diet, alcohol intake, and physical activity should be assessed at every routine evaluation. Patients who smoked >1 cigarette a day, were classified as smokers. As published by Aberg et al. in the 2009 Primary Care Guidelines for the management of HIV-infected persons; blood pressure, body mass index, and pulse should be recorded at each visit.[6] Additionally, fasting serum lipoprotein profile (or total and HDL cholesterol if fasting is unavailable) and fasting blood glucose should be measured according to patient's risk for

hyperlipidemia and diabetes, respectively (at least every five years; if risk factors are present, then annually). Furthermore, most HIV experts agree that fasting lipids and glucose should be checked at the start of antiretroviral therapy and after any treatment change.[6]

In order to assess whether CVD goals were achieved in this population, we used AHA guide to primary prevention of cardiovascular disease, ADA, and NCEP guidelines to define goals.[7] AHA goal for smoking is complete cessation; no exposure to environmental tobacco smoke. Presence of kidney disease was not documented in this study, thus goal blood pressure was defined as < 140/90 for those without diabetes and < 130/80 for those with diabetes. **Low density lipoprotein (LDL)** goal < 160 mg/dL if zero to one risk factor, or LDL < 130 mg/dL if more than two risk factors or if HDL < 35. Physical activity goal is to exercise regularly- three to four times a week for at least 30 minutes. Patients are also expected to maintain desirable weight with a **Body mass index (BMI)** of 21-25 kg/m^2. From the AHA guidelines on secondary prevention there is a goal of aspirin therapy 75mg to 162 mg/day among individuals with history of coronary disease or other vascular disease.[8] Diabetic patients are to have their HbA_{1c} < 7%, according to the 2008 ADA Guidelines.[9]

Partial data were collected from the Immunology Center's electronic database. However, data items that were not available from the electronic database were extracted from the clinic charts. Using information available in the charts we were able to calculate the ten year risk for CVD, CHD, MI and stroke using the Framingham risk calculator developed by Payne at the University of Edinburgh.[10] We also calculated rates of screening for modifiable cardiovascular risk factors, such as smoking, hypertension, dyslipidemia, weight, and diabetes captured in clinic charts and in the Immunology Center database. Lastly, we calculated rates of achieving ADA/AHA/NCEP goals among HIV-infected individuals. We used MS Access and MS Excel to manage the data collection process and SAS v.9.2 for statistical analysis. Categorical variables were compared using Fisher's exact test, and continuous variables were compared using Student's *t* test.

Table 1. Characteristics of the 167 HIV-infected African American women

Characteristic	
Mean Age, (SD)	42 (10)
HIV related	
Mean CD4 cell count cell/uL, (SD)	483 (257)
HIV RNA load <75 copies, mL, (%)	95 (75)
Receipt of HAART, (%)	131 (78)
Current use of protease inhibitor, (%)	75 (57)
Mean years on current regimen, (SD)	1.72 (1.48)
Mean CD4 Counts by Risk Factor	
Smoker	477
Non-smoker	521
Diabetic	464
Non-diabetic	522
Hypertensive	479
Non-hypertensive	523

SD=Standard Deviation; HAART= highly active antiretroviral therapy

Table 2. Framingham Risk Scores a.

Cardiovascular Event	Mean Score
Cardiovascular Disease, (SD)	7.6 (8)
Coronary Heart Disease, (SD)	5.5 (6)
Myocardial Infarction, (SD)	2.9 (3.9)
Stroke, (SD)	1 (1.4)

SD=Standard Deviation
a.The Framingham Risk Score calculates 10 year risk for a cardiovascular event. Age, total cholesterol, **high-density lipoprotein (HDL)**, and systolic blood pressure are used to calculate the score.

Results

A total of 167 African American HIV-infected women were included in the study. Patient demographic and clinical characteristics are shown in Table 1. The average age of this cohort is 42 years. Patients had a mean CD4 count of 483. Patients who smoked or had a history of diabetes or hypertension were found to have lower mean CD4 counts compared to their counterparts. Also patients who received an intervention have higher CD4 counts, although not statistically significant. 131 (78%) of the 167 of women were receiving **highly active antiretroviral therapy (HAART)**. 95 (75%) of women receiving HAART had an undetectable viral load. Current use of HAART was associated with better blood pressure control, p = .05; however, use of HAART was more frequently associated with less desirable outcomes such as hypertriglyceridemia, p = .01, obesity, p < .05 and higher HbA_{1c}, p < .05.

Table 2 shows the Framingham risk scores for MI, CHD, CVD, and stroke. The average risk score for CVD among HIV-infected African American women was 7.6. Ten of the 12 (83%) patients with a personal history of CVD were taking ASA therapy.

BMI

Heights were available for 98 (59%) of the 167 women, thus we were unable to calculate BMI for 69 women. The average BMI was 28, as shown in Table 3. 62 (62%) of those 98 women were classified as overweight, obese or morbidly obese. Only 29 (30%) of 98 women actually achieved goal BMI of 21-25.

Smoking

122 (73%) of 167 women had documentation that they were screened for tobacco use during 2008. Out of the 122, 51 (42%) women were current smokers and 10 reported smoking in past. No one quit smoking, despite almost 75% of the women smokers being offered counseling, medications, or referral to support groups.

Hypertension

67 (42%) women had a history of high blood pressure,as shown in Table 3. The overall mean systolic blood pressure (SBP) was 125 (standard deviation = 15) and the mean **diastolic blood pressure (DBP)** was 80 (standard deviation = 10).

Blood pressure and pulse were recorded at each visit. Of the 67 women with hypertension, 50 (75%) individuals had controlled blood pressure.

Diabetes

54 (33%) women in our cohort had a diagnosis of diabetes, (Table 3). Fasting glucose was recorded on 126 (75%) of 167 women. HbA_{1c} was checked on 47 (87%) women with diabetes. Of the 47 women with HbA_{1c} recorded, 13 (28%) had HbA_{1c} less than 7.0%.

Dyslipidemia

Lipid levels were checked and a full lipid profile was available on 117 (73%) of the patients 1. 47 of the 117 (40%) had a history of dyslipidemia (Table 3). Of the 47 patients with dyslipidemia, 34 (72%) achieved their goal LDL, based on their cardiovascular risk profile.

In summary, overall rates of screening for smoking, diabetes, hypertension and dyslipidemia were 70 percent or greater and 59% for BMI. Counseling plus an oral medication were the most common interventions for hypertension, diabetes, and dyslipidemia**.** Women who received an intervention were more likely to achieve cardiovascular risk reduction goals; however, this trend was not statistically significant. Women who achieved cardiovascular goals had higher mean CD4 counts.

Table 3. Cardiovascular Risk Factors among HIV-infected African American women

BMIa	**N=98**
Under Weight (BMI < 21), (%)	7 (7)
Desired (BMI 21-25), (%)	29 (30)
Overweight (BMI 25-29), (%)	23 (23)
Obese (BMI 30-35), (%)	30 (31)
Morbid obese (BMI >35), (%)	9 (9)
Smoking Status	**N=122**
Current, (%)	51 (42)
Past, (%)	10 (8)
Never, (%)	61 (50)
History of High Blood Pressure	**N=67**
Mean SBP mm Hg, (SD)	125 (15)
Mean DBP mm Hg, (SD)	80 (10)
History of Diabetes	**N=54**
HbA1c less than 7.0%, (%)	13 (28)
Personal history of CVD	**N=12**
Aspirin therapy for those with known cardiovascular disease, (%)	10 (83)
History of Dyslipidemia	**N=47**
Mean TC mg/dL, (SD)	175 (41)
Mean HDL mg/dL, (SD)	48 (18)
Mean LDL mg/dL, (SD)	102 (35)
Mean TG mg/dL, (SD)	123 (71)

SD=Standard Deviation; BMI=body mass index; HDL= high-density lipoprotein; LDL=low-density lipoprotein.
a.BMI was calculated as (weight in pounds * 703) divided by the square of height in inches.

Discussion

The 10 year cardiovascular disease risk in our study was 7.6, which is comparable to scores for African American women without HIV infection. In the literature, the Framingham risk score of African American women ranges from 3.3-8.4.[11, 12]

Our results for screening and achieving goal rates for diabetes and hyperlipidemia were similar to published findings in the general population; there have been no specific rates reported for HIV infected African American women. Rates for achieving goals of HbA_{1c} < 7% in US general medicine clinics are between 30%-44%,[13, 14] our rate was 28%. Current recommendations are to monitor glycosylated hemoglobin (HbA_{1c}) and treat diabetes in HIV-infected individuals the same as in the general population.[15] The majority of studies show that most HIV-infected patients treated for dyslipidemia do not achieve NCEP goals;[15-17] at The Miriam Hospital's Immunology Center, 72% of women achieved NCEP goal lipid levels. Lastly, women who achieved their cardiovascular goals had higher mean CD4 counts than those who did not achieve their goals.

Our study was notable for unusually high rates of smoking. Forty two percent of our cohort smoked tobacco, which is nearly three times the national average of tobacco use among African American women.[18] Despite high rates of counseling, the smoking cessation rate was zero. An investigation into smoking cessation was beyond the scope of this study. However, published studies have shown that smoking cessation efforts can be challenging in the HIV-infected population. One study by Lloyd-Richardson et al. showed that despite motivationally enhanced treatment plus nicotine replacement, rates of smoking cessation remained low among HIV-infected smokers.[19] The authors concluded that standard care treatment of support, education, and nicotine replacement should be encouraged. In the **Women's Interagency HIV Study (WIHS)**, Hispanics and non-Hispanic Caucasians were more likely to quit smoking than non-Hispanic African Americans.[20] At the very least these data highlight the need for future studies to examine how best to address smoking cessation among racial minorities infected with HIV.

An equally important issue among this group is obesity; over 63% of women could be classified as overweight or obese in our study. Obesity is a major problem for many Americans. The fact that there is very little documentation in the clinic charts of this problem may speak to the fact that HIV care providers have traditionally managed wasting disease in their HIV infected population. It is important to manage weight aggressively in this population because of the deleterious effects of obesity.

It is important to recognize the limitations of the present study. First, we had missing data for BMI and for lipid studies and this may have been because we selected patients who had at least 1 clinic visit in the past 12 months. Ideally patients should have more than one visit in a year and if a patient only comes to one visit they may not have received all necessary blood work on that one visit. Second, we were able to calculate rates of different interventions, such as medication, counseling, and referrals, but we may have underestimated the number of specialty referrals because they could have been made prior to January 2008, the

start of this study. Third, this study was done only in African American women in Providence so data cannot be extrapolated to other groups of women, or women living in other regions of the US where the barriers and obstacles of care may be different.

In conclusion, people at risk for CVD are encouraged to maintain a healthy weight, eat a healthy diet that is low in fat and cholesterol, and increase their physical activity. Modification of traditional CVD risk factors and careful selection of ART may aid in preventing CVD among patients with HIV. Research in the future should specifically explore modalities to decrease CVD risk among African American HIV-infected women by introducing more regular and tailored interventions, such as targeted smoking cessation, special nutrition counseling and weight management programs.

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