HIV is Associated with Clinically Confirmed Myocardial Infarction after Adjustment for Smoking and Other Risk Factors

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BACKGROUND

Whether HIV infection is in fact an independent risk factor for acute myocardial infarction (AMI) remains an important question. Prior studies reporting an association between HIV and AMI were typically limited by the lack of a demographically and behaviorally similar HIV uninfected referent group; clinically confirmed AMI outcomes; and or missing data involving important risk factors such as smoking and substance use and abuse.

The objective of this study was to determine whether HIV infection was an independent risk factor for AMI.

METHODS

Cohort: The Virtual Cohort (VC) is a cohort of HIV infected and age, gender, race/ethnicity, and clinical site matched HIV uninfected participants who were identified from United States Department of Veterans Affairs (VA) administrative data in the fiscal years 1998-2003 using a modified existing algorithm. This cohort consists of data from the clinical case registry; the VA HIV registry; the pharmacy benefits management database; the decision support system; the National Patient Care Database, and Health Factor data, which are data collected from physician clinical reminders within the VA electronic medical record system.

The Ischemic Heart Disease Quality Enhancement Research Initiative (IHD-QUERI) is a Veterans Affairs research initiative designed to improve the quality of care and health outcomes of veterans with ischemic heart disease. As part of this initiative, all participants from 2003 through 2008 , were reviewed in order to assess the system wide variations in acute coronary syndromes within the entire VA health care system.

METHODS continued

Participants: 27,379 HIV+ and 55,144 HIV- participants from the VC who were free of baseline CVD in October of 2003.

Dependent variables: AMI was determined by the IHD QUERI. All suspected AMI events were clinically confirmed by trained staff after relevant clinical information including discharge summaries, other physician documentation, procedures note, laboratory testing, and other related health information was reviewed. AMI events include those presenting to the VA for care and those who initially presented to outside hospitals with an AMI and were subsequently transferred to the VA for additional treatment.

Independent Variables: HIV infection was defined as a participant with ≥ 1 inpatient and/or ≥ 2 outpatient International Classification of Diseases (ICD)-9 codes for HIV infection and confirmed by the participant's presence in the clinical case registry.

Covariates: Age, race/ethnicity, hypertension, diabetes, hypercholesterolemia, smoking, hepatitis C, renal disease, BMI, and history of cocaine abuse and dependence, and alcohol abuse and dependence. Systolic and diastolic blood pressures and lipid values were used in accordance with JNC VII and NCEP/ATP III guidelines, respectively, to assess hypertension and hypercholesterolemia.

Statistical Analysis: We assessed descriptive statistics for all variables by HIV status. Cox proportional hazard models were used to estimate the hazard ratio (HR) and 95% confidence intervals (CI) to assess whether HIV infection was an independent risk factor for incident AMI after adjusting for confounders. We calculated age and race/ethnicity adjusted incident AMI per 10,000 person-years. We also compared, all traditional risk factors, important co-morbidities, and substance use and abuse by HIV status among those who experienced an incident AMI. Propensity score weighted Fine Gray models were used to assess competing risk of death.

RESULTS

Table 1. Baseline Characteristics of Veteran Participants stratified by HIV status

Characteristics	HIV+ n=27,379	HIV- n=55,144
Age, years (mean ± SD)	48.5±9.5	49.1±9.3
Race/ethnicity (%)		
African American	47.5	47.4
White	38.0	38.1
Hispanic	7.1	7.8
CHD risk factors (%)		
Hypertension	22.1	32.5
Diabetes	14.3	21.2
Hypercholesterolemia	33.2	38.8
Ever smokers	75.2	72.1
Other risk factors (%)		
Hepatitis C infection	35.1	15.8
EGFR<30ml/min/1.73m^2	1.4	0.5
BMI ≥ 30 (kg/m^2)	13.8	37.7
Hx of Substance Use (%)		
Cocaine abuse or dependence	11.3	7.3
Alcohol abuse or dependence	14.1	13.4
Laboratory Analysis		
Median CD4 count	352	
Median HIV-1 RNA copies/ml	1070	

RESULTS continued

Table 2. HIV status and the risk of AMI

Baseline Risk Factors	HR for AMI 95% CI
HIV infection	1.94 (1.58-2.37)
Age (10 yrs)	1.39 (1.26-1.54)
Race/ethnicity	
African American	0.79 (0.64-0.98)
Hispanic	1.39 (1.03-1.88)
Other	0.42 (0.22-0.80)
Hypertension	1.36 (1.10-1.68)
Diabetes	2.01 (1.68-2.53)
Hypercholesterolemia	1.30 (1.06-1.59)
Ever Smoking	1.87 (1.38-2.52)
HCV infection	1.10 (0.88-1.38)
EGFR<30 ml/min/1.73m^2	4.93 (3.12-7.77)
BMI ≥ 30kg/m^2	0.90 (0.72-1.12)
History of cocaine abuse or dependence	1.42 (0.97-2.09)
History of alcohol abuse or dependence	0.80 (0.56-1.11)

Additional Results:

-Among never smokers, HIV infection was still associated with an Increased risk of AMI (HR=2.42, 95% CI=1.31-4.50)

-Among those who had an AMI, HIV infected participants did not have an AMI at a younger age than HIV uninfected participants (53.0 and 53.1 years respectively, p=0.80), nor was there a difference in time to an AMI (908 days and 960 days, p=0.22)

-Among HIV infected men, after adjusting for all confounders listed in Table 2, baseline classes of ART, HIV-1RNA, and CD4 count were not associated with AMI risk.

LIMITATIONS

The results may not be generalizable to women

The present study does not include cumulative exposure of ARV classes and does not include time updated HIV-1 RNA and CD4 count levels

CONCLUSIONS

HIV infected participants had an increased risk of AMI as compared to demographically and behaviorally similar HIV uninfected participants after adjusting for important confounders.

HIV infection was associated with the same risk of AMI as diabetes and ever smoking

This association persisted when the sample was restricted to never smokers

The age at and time to an AMI event was the same for HIV infected and uninfected participants

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VETERANS AGING COHORT STUDY

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