

# Prevalence of Hepatitis C and Coinfection With HIV Among United States Veterans in the New York City Metropolitan Area

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**OBJECTIVES:** The aims of this study were to determine the prevalence of hepatitis C virus (HCV) infection and its risk factors, as well as the prevalence of coinfection with HIV and its risk factors, among patients with confirmed HCV infection.

**METHODS:** In a 1-day cross-sectional HCV survey at six Veterans Affairs Medical Centers in the New York City metropolitan area, all 1943 patients undergoing phlebotomy for any reason were asked to be tested for HCV antibody by enzyme immunoassay (EIA). A total of 1098 patients (57%) agreed to HCV testing, 1016 of whom also completed a questionnaire on demographics and HCV risk factors. All HCV EIA(+) samples were confirmed by HCV RNA and HCV recombinant immunoblot assay (RIBA) antibody testing and were also tested for HCV viral load, HCV genotype, and antibodies to HIV in a blinded fashion.

**RESULTS:** The prevalence of confirmed HCV infection was 10.6% (95% CI = 8.7–12.4%), and the prevalence of HCV viremia was 8.2% (95% CI = 6.6–9.8%). The rate of HCV viremia among anti-HCV(+) patients was 77.6%, and HCV genotype 1 was present in 87.5% of viremic patients. Independent risk factors for HCV infection were injection drug use (OR = 35.6, 95% CI = 16.9–75.2), blood exposure during combat (OR = 2.6, 95% CI = 1.2–5.7), alcohol abuse (OR = 2.4; 95% CI = 1.2–4.8), and service in the Vietnam era (OR = 2.1; 95% CI = 1.0–4.5). Coinfection with HIV was present in 24.8% of anti-HCV(+) patients. The only independent risk factor for coinfection was age <50 yr (OR = 3.7, 95% CI = 1.1–12.1).

**CONCLUSIONS:** U.S. veterans who are receiving medical care at VA medical centers in the New York City metropolitan area have a much higher rate of chronic hepatitis C than the general population, with a high frequency of genotype 1. Coinfection with HIV is very common in patients with confirmed HCV infection, and these patients should routinely be offered HIV testing. (Am J Gastroenterol 2002; 97:2071–2078.)

## INTRODUCTION

Coinfection with HIV is a significant clinical comorbidity in patients who are chronically infected with the hepatitis C virus (HCV). Patients coinfecting with HIV have higher HCV viral loads (1–3) and experience more rapid progression of HCV-related liver disease than those infected with HCV only (4–6). Epidemiological studies on the prevalence of HCV/HIV coinfection have mainly focused on HCV coinfection among patients with known HIV infection. In a European cohort of more than 3000 HIV+ patients, the overall prevalence of coinfection with HCV was 33% (7). Wide variations were seen, however, depending on the mode of transmission of HIV, ranging from 10% in men who engage in homosexual activity to 90% in injection drug users. It is now recommended that all HIV-infected patients routinely be tested for HCV antibodies (8).

Few studies have looked at HIV coinfection in patients diagnosed with hepatitis C. A study in France reported HIV coinfection in 57% of 2007 newly identified anti-HCV(+) individuals (9). A retrospective review of all HCV and HIV serological tests from 1990–1999 in a single medical center (Bronx VA Medical Center; N. Bräu, unpublished data) identified 1189 anti-HCV(+) patients; 532 of these were tested for HIV with a coinfection rate of 36%. However, the data from both studies probably overestimated the coinfection rate because of selection bias. Physicians are more likely to obtain HCV antibody testing in HIV-infected pa-

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tients than in those in whom HIV is not suspected, thus contributing to a higher HCV/HIV coinfection rate. The present cross-sectional study evaluated U.S. veterans living in the New York City metropolitan area who receive care at a Veterans Affairs Medical Center (VAMC). The aims of this study were: 1) to determine the prevalence of HCV infection and its risk factors in this patient population, and 2) to assess the prevalence of HIV coinfection and its risk factors in the subgroup of anti-HCV(+) patients identified during this survey.

## MATERIALS AND METHODS

### Study Design

On March 17, 1999, a nationwide survey was conducted among U.S. veterans to determine the prevalence of HCV infection. On that day, all veterans (inpatient or outpatient) who had blood drawn for any reason at a VAMC were asked to consent to have additional blood analyzed for HCV antibody by enzyme immunoassay (EIA) and to fill out a questionnaire. The present study focuses on data collected from the sites in the New York/New Jersey Veterans Integrated Service Network 3 (VISN 3, New York City metropolitan area). This network includes VAMCs in Bronx, NY; New York, NY; Brooklyn, NY; Northport (Long Island), NY; and the VA Healthcare Systems in Hudson Valley (Montrose, NY; Castle Point, NY) and New Jersey (East Orange, NJ; Lyons, NJ).

Questionnaire data collected on each patient included age, race, era of military service (World War I, World War II, Korean War, post-Korean War, Vietnam, post-Vietnam, Gulf War), risk factors for HCV infection (blood transfusion before 1992, injection drug use, cocaine use, tattoos, body piercing, number of sexual partners, blood contact during combat, and alcohol abuse [as ascertained by the question, "Have you ever had a drinking problem?"]), location at the time blood was drawn (inpatient vs outpatient), the specialty of the referring clinic, the VAMC testing site, and whether the patient was already known to be HCV-antibody positive. The questionnaire did not ask about risk factors for HIV, such as men engaging in homosexual activity, because the survey was designed for hepatitis C.

### HCV and HIV Testing

Testing for antibodies to HCV was done at each of the participating facilities using a third generation EIA (Ortho HCV EIA version 3.0; Ortho Clinical Diagnostics, Raritan, NJ).

All EIA-3(+) samples were confirmed at a central laboratory (Bronx VAMC) by qualitative HCV polymerase chain reaction (PCR) testing (COBAS AmpliCor HCV Test, version 2; Roche Diagnostics, Somerville, NJ; sensitivity 100 copies/ml). Samples that were HCV RNA(-) underwent serological confirmation by recombinant immunoblot assay (RIBA) antibody testing (Chiron RIBA HCV 3.0 Strip Immunoblot Assay; Chiron, Emeryville, CA).

Samples that were HCV EIA(+) and HCV RNA(+) were considered confirmed anti-HCV(+) with chronic HCV infection. Samples with EIA(+), RNA(-) and RIBA(+) were considered confirmed anti-HCV(+) with resolved (not chronic) HCV infection, and EIA(+), RNA(-), RIBA(-) samples were considered EIA false positive.

All HCV EIA(+) samples were tested for antibodies to HIV (HIVAB HIV-1/HIV-2 EIA; Abbott Laboratories, Abbott Park, IL), with confirmation of HIV EIA(+) tests by Western blot analysis (Novapath HIV-1 Immunoblot; Bio-Rad Diagnostics, Hercules, CA). Each sample that was HCV RNA(+) also underwent testing for HCV viral load using quantitative HCV PCR testing (COBAS AmpliCor HCV Monitor; Roche Diagnostics, Somerville, NJ; dynamic range 1,000 to 1,000,000 copies/ml) and HCV genotyping (Inno-LiPA HCV 11; Innogenetics, Ghent, Belgium).

All patients provided written informed consent for HCV EIA testing and for data analysis of questionnaires. They were notified about their HCV EIA test result by their clinicians. All subsequent testing of the HCV EIA(+) samples were performed in a blinded (anonymous) fashion after all links to the identity of the individual patients were removed and replaced by a study number. This procedure was used to conform to ethical standards for anonymous HIV testing in epidemiological studies without individual consent, as set forth by the U.S. Centers of Disease Control and Prevention (CDC) since 1990 for sentinel HIV surveys (10–12). The study, including the blinded HIV testing, was approved by the Human Studies Subcommittee of the Bronx VAMC, and it conformed to ethical guidelines of the 1975 Declaration of Helsinki. For this report, the term "coinfection" is used for individuals who have confirmed serological evidence of HCV infection (resolved or chronic) as well as seropositivity for HIV, where almost all patients have chronic HIV infection.

### Statistical Analysis

Continuous variables were compared using the Student's *t* test or Mann-Whitney *U* test as appropriate. Categorical variables were compared using Fisher's exact test or  $\chi^2$  analysis. Multivariate models were constructed using forward stepwise logistic regression analysis to determine independent risk factors for HCV infection, as well as independent risk factors for HCV and HIV coinfection. Statistical analysis was performed using SPSS version 10.0 for Windows (SPSS, Chicago, IL).

## RESULTS

On March 17, 1999, a total of 1943 veterans had a blood test done for any of a number of reasons in one of the six VAMCs of VISN 3; of these individuals, 1098 (56.5%) agreed to be tested for antibodies to HCV by EIA-3. The number of patients tested at each VA facility, in order of decreasing frequency, were as follows: New Jersey (*n* = 250); Brooklyn, NY (*n* = 197); New York, NY (*n* = 181);

**Table 1.** Characteristics of the Patients Tested for Hepatitis C

Number of patients*	1016
Age, yr (median, range)	66 (22–99)
Age <50 yr	16.1%
Outpatient	79.3%
Ethnicity	
White	58.0%
African American	30.8%
Hispanic	10.3%
Other	0.9%
Era of military service	
World War I	0.5%
World War II	35.7%
Korea	24.2%
Vietnam	25.2%
Post-Vietnam	4.9%
Gulf War	1.9%
Other	7.6%
Blood transfusion	19.9%
Injection drug use	7.8%
Cocaine use	16.2%
Tattoo	18.2%
Body piercing	7.6%
Blood contact during combat	14.8%
Number of sexual partners	
0–2	28.6%
3–10	33.8%
11–50	28.3%
>50	9.4%
Alcohol abuse	24.8%

\* Questionnaires were available for 1016 (92.5%) of the 1098 patients who tested for HCV EIA.

Northport, NY (n = 161); Bronx, NY (n = 173); and Hudson Valley, NY (n = 136). Of these 1098 veterans, 1016 (92.5%) completed the questionnaire. The clinical characteristics of these patients are shown in Table 1. Among the patients who were tested for antibodies to HCV, only 6.2% were referred from the psychiatry or substance abuse service, 2.3% from infectious diseases clinics, and 1.4% from gastroenterology or liver clinics, areas that typically have a high prevalence of HCV infection.

### Hepatitis C Test Results

Of the 1098 veterans in VISN-3 who participated in the study and were tested for antibodies to HCV, 138 (12.6%) tested EIA(+). Of these, 90 (65.2%) were viremic by qualitative PCR testing. An additional 26 HCV EIA(+) patients who were HCV RNA(–) tested RIBA(+). Thus, 116 of the 138 EIA(+) samples (84.1%) were confirmed anti-HCV(+) by qualitative PCR or RIBA. The remaining 22 EIA(+) tests (15.9%) were false positives, all of them occurring in HIV(–) patients. Therefore, the prevalence of HCV infection, *i.e.*, confirmed anti-HCV(+), whether chronic or resolved, was 10.6% (116/1098, 95% CI = 8.7–12.4%). Among the anti-HCV(+) patients, 43.5% already knew that they were positive. The prevalence of chronic hepatitis C (HCV RNA+) was 8.2% (90/1098, 95% CI = 6.6–9.8%). The rate of viremia among confirmed anti-HCV(+) patients was 77.6% (90/116). The results of all hepatitis C tests are summarized in Table 2.

**Table 2.** Results of Hepatitis C Testing in the 1098 Veterans in the New York City Metropolitan Area

Patients	Number (%)
All patients tested	n = 1098
HCV EIA-3(+)	138 (12.6%)
Confirmed anti-HCV(+) [HCV RNA(+) or RIBA(+)]	116 (10.6%)
HCV chronic infection [HCV RNA(+)]	90 (8.2%)
All EIA-3(+) patients	n = 138
HCV chronic infection [HCV RNA(+)]	90 (65.2%)
HCV resolved (not chronic) infection [HCV RNA(–) and RIBA(+)]	26 (18.8%)
HCV false positive EIA [HCV RNA(–) and RIBA(–)]	22 (15.9%)
All confirmed anti-HCV(+) patients	n = 116
HCV chronic infection [HCV RNA(+)]	90 (77.6%)

The prevalence of HCV in each of the VAMCs in VISN-3 is shown in Figure 1. Among the 90 viremic patients, sufficient serum was available for quantitative PCR testing in 82 (91.1%) and genotype analysis in 80 (88.9%). The median HCV viral load was >1,000,000 copies/ml (range 110,900 to >1,000,000 copies/ml). Of the 82 viremic patients, 59 (72.0%) had an HCV viral load >1,000,000 copies/ml. The results of genotype analysis are shown in Figure 2. Genotype 1 was present in 87.5% of viremic patients, and the genotype distribution was as follows: 1a (38.8%), 1b (47.5%), 1a/1b (1.3%), 2b (7.5%), 2a/2c (1.3%), 3 (1.3%), 3a (1.3%), and 4 (1.3%).

### Risk Factors for HCV Infection

In the univariate analysis, age <50 yr, nonwhite ethnicity, service in Vietnam, injection drug use, cocaine use, tattoos, body piercing, blood contact during combat, >10 lifetime sexual partners, and a history of alcohol abuse were significantly associated with confirmed HCV infection (Table 3). In the multivariate model, logistic regression analysis identified injection drug use (OR = 35.6; 95% CI = 16.9–75.2;  $p < 0.001$ ), blood exposure during combat (OR = 2.6; 95% CI = 1.2–5.7;  $p = 0.02$ ), alcohol abuse (OR = 2.4; 95% CI = 1.2–4.8;  $p = 0.02$ ), and service in Vietnam (OR = 2.1; 95% CI = 1.0–4.5;  $p = 0.04$ ) as independent risk factors for HCV infection. After a multivariate analysis showing alcohol as independent risk factor, a further analysis revealed that among patients with chronic hepatitis C, *i.e.*, HCV RNA(+), 53.4% reported alcohol abuse.

### HIV Test Results

Among the 138 patients who tested HCV(+) by EIA, sufficient serum was available for HIV testing in 122; of these, 105 samples were from confirmed anti-HCV(+) patients. The prevalence of HIV coinfection among anti-HCV(+) patients was 24.8% (26/105). All cases of HIV coinfection occurred in patients who were confirmed anti-HCV(+); that is, no patient with a false positive HCV EIA test was HIV(+). The prevalence of HIV coinfection in each of the medical centers in VISN-3 is shown in Figure 3. Urban VAMCs (those in the Bronx, New York, and Brooklyn) had

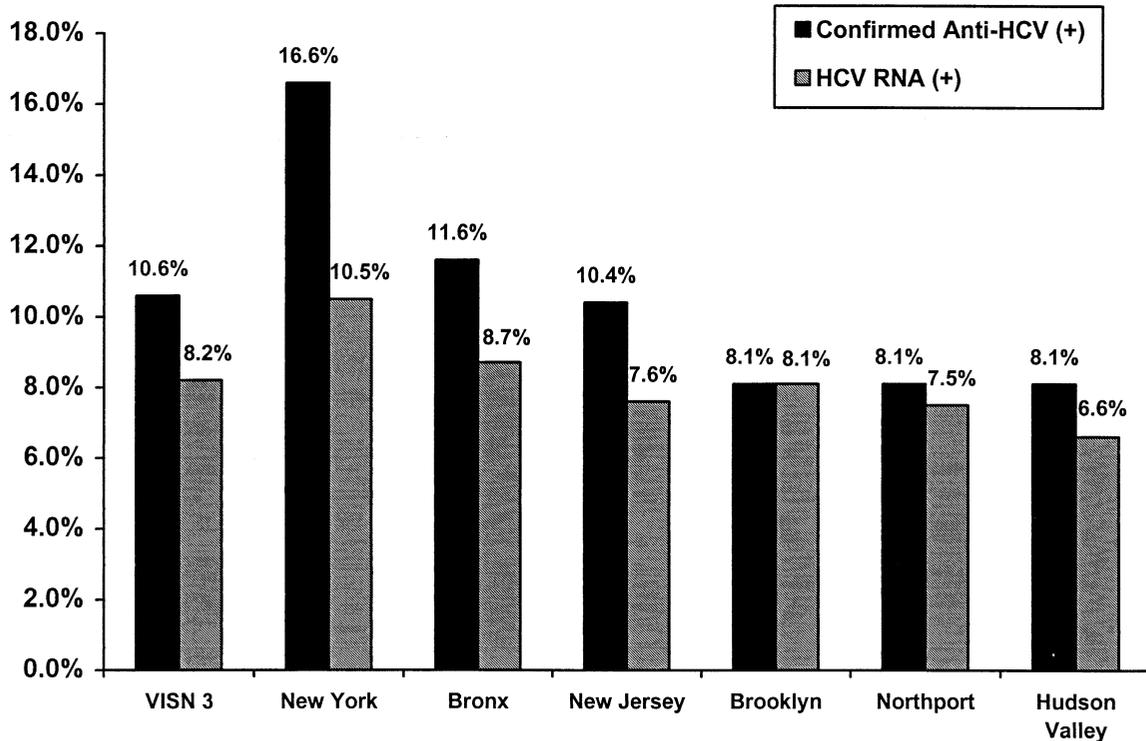


Figure 1. Prevalence of HCV infection and chronic viremia in the VA Medical Centers of VISN 3.

a significantly higher prevalence of HIV coinfection (28.9% vs 8.7%,  $p = 0.008$ ) than did the suburban medical centers (Hudson Valley, Northport, and New Jersey). Among the 26 HIV-infected patients, only five (19.2%) were referred for HCV testing from infectious disease clinics. HIV(+) and HIV(-) patients showed no difference in the prevalence of HCV viremia (84.6% vs 79.7%,  $p = 0.78$ ) and of genotype 1 (89.5% vs 86.2%,  $p = 0.71$ ).

**Risk Factors for HIV Infection**

In the univariate analysis, age <50 yr, nonwhite ethnicity, injection drug use, and cocaine use were significantly associated with HIV coinfection (Table 4). In the multivariate model, logistic regression analysis identified age <50 yr (OR = 3.7; 95% CI = 1.1–12.1;  $p = 0.03$ ) as the only independent risk factor for HIV coinfection. After the multivariate analysis, an analysis of age and HIV coinfection

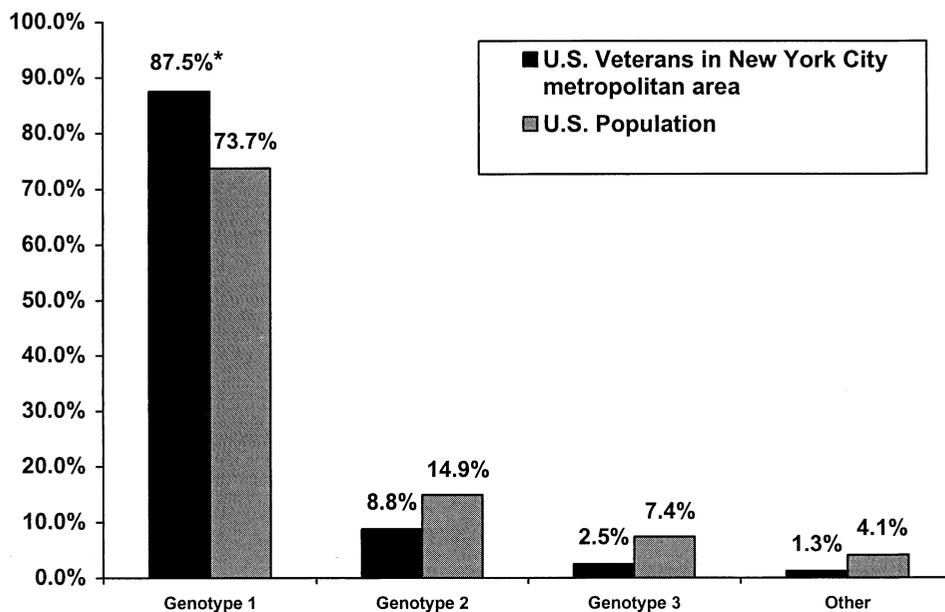


Figure 2. Distribution of HCV genotypes. \* $p = 0.01$  for comparison with U.S. population (16).

**Table 3.** Risk Factors for HCV Infection, *i.e.*, Confirmed Anti-HCV(+)

Risk Factor	Univariate Analysis				Multivariate Analysis	
	Present in Anti-HCV(+)	Present in Anti-HCV(-)	OR (95% CI)	<i>p</i> Value	OR (95% CI)	<i>p</i> Value
Age <50 yr	50.0%	13.2%	6.6 (4.0–10.8)	<0.001		ns
Outpatient	76.1%	79.6%	0.8 (0.5–1.5)	0.50		ns
Nonwhite ethnicity	70.7%	39.5%	3.7 (2.2–6.2)	<0.001		ns
Service in Vietnam	44.0%	22.8%	2.7 (1.8–4.0)	<0.001	2.1 (1.0–4.5)	0.04
Blood transfusion	18.3%	20.0%	0.9 (0.5–1.7)	0.74		ns
Injection drug use	65.8%	3.0%	62.3 (33.5–116.0)	<0.001	35.6 (16.9–75.2)	<0.001
Cocaine use	61.6%	12.4%	11.4 (6.8–19.0)	<0.001		ns
Tattoo	31.1%	17.1%	2.2 (1.3–3.7)	0.003		ns
Body piercing	15.3%	7.0%	2.4 (1.2–4.8)	0.01		ns
Blood contact during combat	37.5%	12.9%	4.1 (2.4–6.8)	<0.001	2.6 (1.2–5.7)	0.02
More than 10 sexual partners	60.7%	35.8%	2.8 (1.6–4.7)	<0.001		ns
Alcohol abuse	55.4%	22.1%	4.4 (2.7–7.1)	<0.001	2.4 (1.2–4.8)	0.02

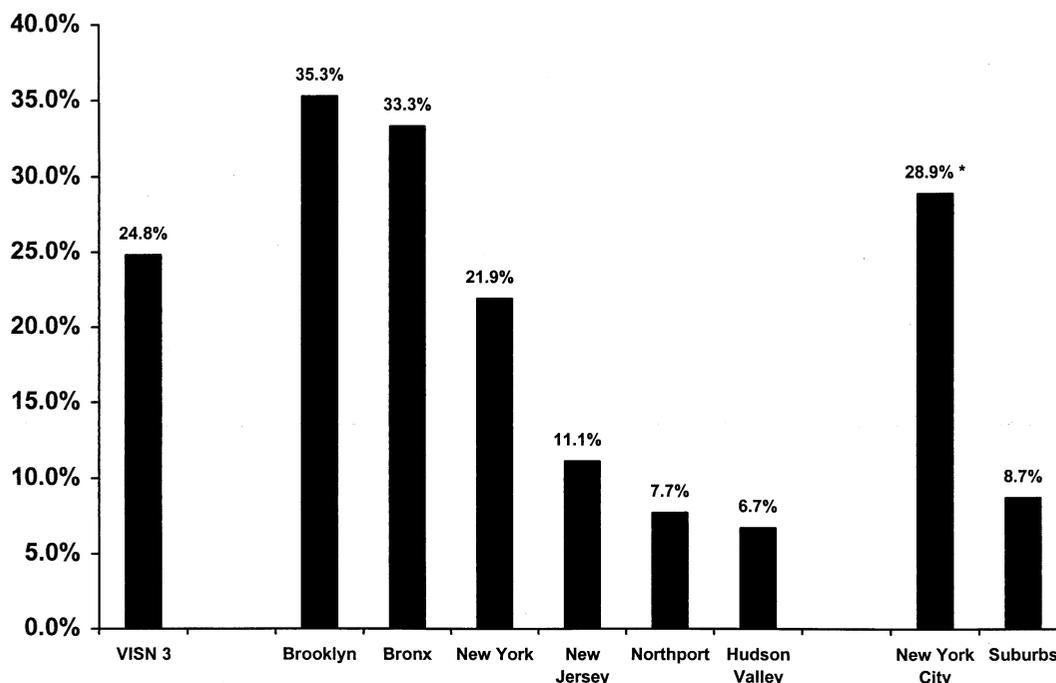
status showed that HIV coinfecting patients had a median age of 47.5 yr (range 40–54 yr), whereas anti-HCV(+)/HIV(-) patients had a median age of 50.0 yr (range 37–82 yr). Anti-HCV(+) patients in the urban centers were more likely to be <50 yr old than were patients in the suburban centers (52.1% vs 46.2%,  $p = 0.03$ ).

## DISCUSSION

This 1-day national hepatitis C survey among U.S. veterans was prompted in part by earlier pilot studies suggesting a high HCV seroprevalence of 19% in VA outpatients (16) and of 12% in hospitalized veterans (14). The nationwide study reported that 6.6% of U.S. veterans ( $n = 26,102$ )

screened HCV(+) by EIA testing, but positive results were not confirmed (15). The present study found an HCV EIA(+) rate of 12.6% among U.S. veterans in the New York City area, the highest among all VA regions. The true prevalence of HCV infection (*i.e.*, confirmed positivity for anti-HCV), was 10.6%. This is substantially higher than the rate of 1.8% found in the general U.S. population (16). The majority of anti-HCV(+) patients (56%) were unaware of their diagnosis. Chronic HCV viremia was present in 8.2% of patients, indicating that a large number of VA patients in the New York City metropolitan area are at risk for progressive liver disease from hepatitis C.

The 1-day cross-sectional method of identifying patients for this survey is not without potential bias, because patients



**Figure 3.** Prevalence of HIV infection among confirmed anti-HCV(+) patients in the VA Medical Centers of VISN 3. \* $p = 0.008$  for comparison of New York City vs suburbs.

**Table 4.** Risk Factors for HIV Coinfection in Confirmed Anti-HCV(+) Patients

Risk Factor	Univariate Analysis				Multivariate Analysis	
	Present in HIV(+)	Present in HIV(-)	OR (95% CI)	<i>p</i> Value	OR (95% CI)	<i>p</i> Value
Age <50 yr	66.7%	39.4%	3.1 (1.0–9.2)	0.04	3.7 (1.1–12.1)	0.03
Outpatient	78.6%	75.8%	1.2 (0.3–4.8)	0.83		ns
Nonwhite ethnicity	100.0%	60.0%	1.5 (1.2–1.7)	<0.001		ns
Service in Vietnam	57.7%	39.6%	2.1 (0.9–5.0)	0.10		ns
Blood transfusion	27.8%	12.9%	2.6 (0.7–9.3)	0.15		ns
Injection drug use	83.3%	48.4%	5.3 (1.4–20.2)	0.01		ns
Cocaine use	83.3%	45.3%	6.0 (1.6–22.9)	0.006		ns
Tattoo	22.2%	33.8%	0.6 (0.2–1.9)	0.40		ns
Body piercing	23.5%	14.1%	1.9 (0.5–7.1)	0.46		ns
Blood contact during combat	44.4%	29.7%	1.9 (0.6–5.5)	0.24		ns
More than 10 sexual partners	69.2%	55.4%	1.8 (0.5–6.6)	0.54		ns
Alcohol abuse	55.6%	47.7%	1.4 (0.5–3.9)	0.56		ns

who undergo phlebotomy for diagnostic tests may have a higher morbidity (including from HCV and HIV infection) than patients with infrequent or no blood drawing. However, in this study only a small proportion of patients were referred from gastroenterology, infectious diseases, and substance abuse clinics (9.9% total), where higher rates of hepatitis C are expected. The rates of HCV infection were obtained from U.S. veterans who received health care at a VAMC in the New York City region and who agreed to be tested. These data cannot be extrapolated to other veterans networks, to all U.S. veterans receiving care at VA facilities, or to U.S. veterans in general.

All HCV EIA(+) samples were confirmed first by HCV RNA, and by HCV RIBA only in HCV RNA(-) samples. This confirmation method has the advantage of providing direct information on chronic HCV viremia while avoiding costly RIBA assays in the 65% of HCV EIA(+) samples that are RNA(+). The rate of HCV viremia among all confirmed anti-HCV(+) patients was 77.6%, a rate comparable to the rate of 73.9% reported for the general U.S. population (16). Similarly, in a study of 15,250 pregnant women in Italy, 370 of whom were confirmed anti-HCV(+), 71.9% of them were shown to be viremic (17). Thus, these two studies together with the current study confirm a rate of HCV viremia of about 75%, which is lower than the rate of 86% reported in one earlier study of 248 blood donors (18).

HCV genotype 1 was significantly more prevalent in this study than in the general U.S. population (88% vs 74%,  $p = 0.02$  by  $\chi^2$  analysis) (13). Most likely, this higher prevalence is due to a higher proportion of African American individuals in this survey (30.8%) than in the general U.S. population (12.1%) (19). A recent HCV genotype survey in 6807 patients with chronic hepatitis C found genotype 1 to be more common in African American individuals than those of white, Hispanic, or Asian ethnicity (20). In the present study, however, the trend toward higher prevalence of genotype 1 in African American individuals did not reach statistical significance.

The analysis of HCV confirmation found a relatively high

rate (16%) of false positive HCV EIA-3 tests, even though it was conducted in a high prevalence population and the more sensitive and specific 3rd generation EIA assay was used. HIV seropositivity was not a confounding factor, as all HCV false positive cases were HIV(-). It can be expected that in areas of low HCV seroprevalence, the false positive EIA rate would be even higher. This limits the usefulness of the HCV EIA test for epidemiological studies that focus on HCV infection. In this study, only 65% of patients who screened HCV EIA(+) were viremic, and in lower prevalence areas, even fewer HCV EIA(+) patients are likely to have chronic hepatitis C. The study did not address the issue of false negative HCV antibody tests in patients with advanced HIV infection, as only anti-HCV(+) patients were tested for HIV.

The study identified injection drug use, alcohol abuse, service in the Vietnam era, and exposure to blood during combat as independent risk factors for HCV infection. Injection drug use is a well known mode of transmission of blood-borne viruses such as HIV and both hepatitis B and C viruses. Alcohol abuse by itself does not transmit HCV, but it may serve as a surrogate marker for undisclosed injection drug use, as drug and alcohol abuse frequently coexist. An earlier study identified alcoholism requiring detoxification as an independent risk factor for anti-HCV(+) in the absence of acknowledged known risk factors (21). Service in the Vietnam era may be a marker for undisclosed injection drug use as well. Vietnam veterans commonly engaged in substance abuse, including injection drug use, especially those who experience chronic posttraumatic stress disorder (22, 23). By contrast, U.S. veterans with posttraumatic stress disorder from other combat theaters (World War II, Korea) commonly developed alcoholism but rarely other substance abuse (24). Exposure to blood during combat may have served as a direct mode of transmission, as HCV viremia was found in U.S. servicemen as early as 1948–1954 (25). Recently, the U.S. Department of Veterans Affairs has added “Vietnam-era veteran” to the risk factors that should prompt VA clinicians to test patients for anti-HCV (26). Among veterans with chronic hepatitis C in this study,

alcohol abuse was very common (53.4%), placing the majority of these patients at high risk for progressive liver disease (27–29).

The prevalence of HIV coinfection among anti-HCV(+) patients was 24.8%. This coinfection rate was derived from a group of anti-HCV(+) patients identified during a 1-day survey, thereby minimizing selection bias. Such selection bias may have led to overestimation of HIV coinfection rates in previous studies, as HIV(+) patients were more likely to be referred for HCV testing. Raguin *et al.* (9) reported 57% HIV coinfection in 2002 newly diagnosed anti-HCV(+) patients in France. However, in that survey, infectious disease specialists referred 25% of these subjects, in whom the coinfection rate was 89%. The remaining patients were referred from internal medicine specialists, some of whom may be caring for HIV(+) patients. In the present study, only 2.3% of all patients were referred from the infectious diseases clinic where all HIV(+) patients receive care. It is not known how many of the coinfecting patients in this study knew about their HIV diagnosis, given the nature of blinded HIV testing, which was stripped of all patient identifiers. This method does not permit going back to individual subjects. Because only a minority (19%) of coinfecting patients were referred from an infectious diseases clinic, it is possible that a substantial number of these individuals had not previously been identified as being HIV infected.

Age <50 yr was the only independent risk factor for HIV coinfection. This may be the result of the different timing of the HCV and HIV epidemics. HCV infection was identified in human patients as early as 1948 (25). By contrast, the first individuals with opportunistic illnesses from HIV infection were described only in 1981 (30–32). With a median of 10 yr from initial HIV infection to clinical AIDS (33), and with 13% of HIV-infected persons progressing to AIDS within 5 yr of infection (34), there was probably no (or, at most, sporadic) HIV infection in the United States before 1975. Patients who were exposed to such contaminated blood with HCV alone before 1975 are now likely to be aged 50 yr or older. Conversely, patients <50 yr of age today are more likely to have been exposed to blood after 1975, when it could have been contaminated with both HCV and HIV. In this study, no anti-HCV(+) patient aged  $\geq 55$  yr was coinfecting with HIV, lending further support to this theory. HIV coinfection was significantly more common in the three urban VAMCs than in the suburban centers. This difference may be explained by the higher prevalence of patients <50 yr of age in the urban setting.

We conclude that chronic hepatitis C is common among U.S. veterans using the VA healthcare system in the New York City metropolitan area, with alcohol abuse complicating more than half of chronic hepatitis C cases. Treatment will be a challenge in these patients, as the vast majority of them are infected with HCV genotype 1, which responds less well to therapy (35, 36). The association that was found in this study between HCV infection and alcohol abuse,

service in the Vietnam era, or blood exposure during combat warrants further investigation. Patients with these risk factors should be offered HCV testing. HIV coinfection is common in patients with hepatitis C, especially in those less than 50 yr of age; therefore, all anti-HCV(+) patients should be tested for HIV.

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