Hepatitis-C Prevalence in an Urban Native-American Clinic: A Prospective Screening Study

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Background: Native-American populations are disproportionately burdened by chronic liver disease, and the prevalence of hepatitis C (HCV) in native Americans is unknown.

Purpose: To determine the prevalence of hepatitis C in a local native-American population via a prospective screening study.

Procedures: Two-hundred-forty-three native Americans (161 females/82 males) using an urban clinic and representing >30 tribes from across the United States were screened. Mean age was 41 ± 1 years. Hepatitis-C screening was by anti-HCV with confirmation by HCV RNA. A questionnaire assessed potential risk factors for HCV.

Findings: Anti-HCV antibodies were found in 11.5% (95% CI: 7.5–15.5%). HCV RNA was present by polymerase chain reaction (PCR) in 8.6% (95% CI: 5.1–12.1%) and was more common in males [13.4% (95% CI: 6.0–20.8%)] than females [6.2% (95% CI: 2.5–9.9%)]. The most common potential risk factors for chronic HCV infection were intravenous (IV) drug or cocaine use ($p<0.0001$), tattoos >5 years old ($p<0.0001$) and having a sexual partner with HCV ($p=0.0063$).

Conclusion: HCV prevalence is higher in an urban native-American clinic population than reported in the general U.S. population. Use of IV drugs is the most prevalent risk factor, but tattoos and sexual transmission may also be important.

Key words: hepatitis ■ Native Americans

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INTRODUCTION

Hepatitis C (HCV) is the most common chronic blood borne infection in the United States.[1] Hepatitis-C infection is most common in non-Caucasian men, ages 30–49.[1-3] While epidemiology studies have shown racial differences in HCV prevalence, there is little data concerning hepatitis-C prevalence in native Americans. In the National Health and Nutrition Examination (NHANES) III study and also the recently reported NHANES (1999–2002), American Indian/Alaska native was not a recorded race.[3,4]

The purpose of our study was to determine the prevalence of HCV and any culturally specific risk factors in an urban native-American population. We first performed a retrospective chart review of all known HCV cases in an urban American-Indian clinic based on HCV diagnostic codes in a computerized medical record. The results of this study were used to generate a survey of health history and risk factors for hepatitis C. A prospective study was then performed in an urban clinic that serves any native American living in or visiting the area to identify of HCV prevalence and risk factors for hepatitis-C infection.

METHODS

This study was performed at the request and with the participation of the clinic staff at the Fred LeRoy Health and Wellness Center in Omaha, NE. It was approved by the institutional review board at the University of Nebraska Medical Center and the Tribal Council of the Fred LeRoy Health and Wellness Center. This facility is an Indian Health Service 638 health center that serves all native Americans enrolled in any tribe anywhere in the United States. It also functions as a community center. It currently has a registered adult patient population of approximately 3,000 and an estimated annual service population of 1,000, representing tribes across the United States, although predominantly from the Great Plains area. The greater Omaha area has a population of approximately 800,000.

Recruitment occurred during all clinics and clinic-sponsored health fairs. All American-Indian adults aged

>19 years were approached for screening, regardless of whether they had known HCV or risk for HCV, including pregnant women. This included all patients and their accompanying family members and friends during clinic visits.

Hepatitis-C screening followed the CDC recommended protocol and evaluated for anti-HCV by enzyme-linked immunosorbent assay (EIA), (Abbott Laboratories, Abbott Park, IL) with confirmation of viremia by polymerase chain reaction (PCR) for qualitative HCV RNA (Amplicor™ HCV Test v2.0 by Roche Diagnostics, Somerville, NJ or primer/platform by Abbott Laboratories, Abbott Park, IL).[5,6]

Hepatitis-C exposure was defined as a positive screen for hepatitis-C antibodies. Hepatitis-C chronic infection was defined as the presence of HCV RNA. A false positive was defined as a positive screening test (EIA) with a negative confirmatory test (RNA).

Age, gender, tribal affiliation, residence (reservation versus urban), height, weight, waist circumference and body mass index (BMI) were collected. A short multiple-choice/short-answer questionnaire was administered in private by clinic personnel and assessed behaviors and potential risk factors for HCV. Hepatitis-C risk factors that were assessed included presence and type of tattoos (tattoo parlor versus homemade), body piercing, history of a sexual partner with hepatitis C, use of cocaine or intravenous (IV) drugs, history of alcoholism by self-admission or an affirmative response to ≥3 CAGE (cut down, annoyed, guilty, eye opener) questions,[7] prior treatment at a local cancer clinic that had a large nosocomial HCV outbreak,[8,9] family history of liver disease, stabbings or participation in a Sun Dance ritual (which involves cutting the skin with a ceremonial knife). The survey also included history of abnormal liver function tests, liver disease or jaundice, kidney dialysis, dates of past blood transfusions, organ transplants or history of HIV/AIDS. It also recorded whether they had ever been told they had hepatitis C, were ever treated for hepatitis C or had received a liver biopsy.

Patients with a confirmed diagnosis of HCV by PCR were offered liver function tests, a liver ultrasound and a one-on-one counseling session with a physician to confirm survey data and discuss the implications of HCV, treatment options and the importance of sobriety. A referral to a hepatologist for additional testing and/or liver biopsy and consideration of treatment was scheduled.

Statistical analysis was performed as follows: groups were compared by Student's t test or Mann-Whitney test where appropriate. Contingency tables were evaluated by Chi-squared or Fisher's exact test as indicated by group size. A p value of <0.05 was considered significant. Values are expressed as mean ± standard error of the mean (SEM) unless otherwise indicated.

RESULTS

In the prospective study, 249 signed consent, but six had never had blood drawn, so 243 (161 females/82 males) from >30 tribes were screened. Approximately one-fourth of the estimated annual adult clinic population was screened. The clinic staff can recall only two people (both women) who declined to participate, citing that the tight-knit community was very supportive of this community-initiated project.

The age distribution of those screened was similar to the clinic age distribution. Mean age was 41 ± 1 years. The overall clinic population was 44% male, while the study population was 34% male. No subject from the retrospective chart review was enrolled in the prospective screening study, although not specifically excluded. The majority lived in an urban environment, as only seven subjects (2.9%) stated they lived on an Indian reservation.

The prevalence of HCV exposure (anti-HCV) was 11.5% (95% CI: 7.5–15.5%). The prevalence of chronic HCV infection by RNA was 8.6% (95% CI: 5.1–12.1%): 13.4% in males (95% CI: 6.0–20.8%) and 6.2% in females (95% CI: 2.5–9.9%) (Table 1). All infected individuals were between the age of 30–59 years (Table 2). False-positive cases, defined as positive anti-HCV antibodies and negative HCV RNA, represented 2.9% of the population overall, 4.9% in men and 1.9% in women. Most of these participants (6/7) had a prior history of IV drug use.

Age was similar between hepatitis-C-positive and -negative participants (44.9 ± 1.6 years vs. 41.1 ± 0.9 years, respectively, p=0.08). The most common potential risk factors for chronic HCV infection (Table 3) were IV drug or cocaine use (66.7% vs. 25.1%, $p<0.0001$), tattoos >5 years old (38.1% vs. 8.8%, $p<0.0001$) or sexual partner with HCV (19.0% vs. 2.3%, p=0.0063). Other significant risk factors are detailed in Table 3. Nonsignificant factors in this population were homemade tattoos, prior treatment at a local

Table 1. HCV prevalence: total and by gender

	Overall (%)	n	HCV Antibody Prevalence (%)	n	95% CI	HCV RNA Prevalence (%)	n	95% CI
Female	66.3%	161	8.1%	13	3.9–12.3%	6.2%	10	2.5–9.9%
Male	33.7%	82	18.3%	15	9.9–26.7%	13.4%	11	6.0–20.8%
Total	100.0%	243	11.5%	28	7.5–15.5%	8.6%	21	5.1–12.1%

cancer clinic that had a large nosocomial HCV outbreak, stabbings, participation in a Sun Dance ritual, kidney dialysis, prior organ transplant, history of HIV/AIDS or family history of liver disease.

DISCUSSION

One of the most commonly cited sources for prevalence of hepatitis C is the NHANES database, in which in 1999–2002, HCV antibody prevalence was determined to be 1.6% (95% CI: 1.3–1.9%), or an estimated 4.1 million Americans.[4] Chronic HCV infection affects approximately 3.2 million in the United States[4] and is projected to cause a four-fold increase in persons at risk for chronic liver disease by 2015.[2] However, the NHANES database excludes native Americans in that it does not collect information from native Americans living on reservations, and it does not record American Indian/Alaska native as an epidemiologic category. Yet few other studies identify HCV prevalence in native Americans, even though American Indians have a disproportionate burden of chronic liver disease.[10]

In recent studies published after this study was initiated, HCV antibodies were found in 3% of pregnant American-Indian women who were screened during routine prenatal care.[11] In a large population-based study of an Alaska-native population living in Alaska, which included American Indian as well as Eskimo and Aleut, 981 confirmed cases of chronic HCV infection were found, indicating an HCV RNA prevalence of 0.82%.[12] Among that group, the highest HCV RNA prevalence was in those between the ages of 40–59 (2.63%). One of nine American Indians/Alaska natives screened in a multicenter Veterans Affairs medical center prevalence study were positive for HCV antibodies, with an adjustment for nonparticipation estimating a prevalence of 32.7 per 100.[13] However, their number of American-Indian/Alaska-native participants screened was very small (n=9).

Our data represent the broadest screening of an American-Indian-specific (non-Alaska-native) population and suggests a higher prevalence of chronic hepatitis-C infection than previously described in any native-American group, and a higher prevalence of HCV in this native-American population than in the general population. However, it should be noted that there are inherent limitations in any direct comparison between studies with different selection criteria and different population groups.

The false-positive rate identified in this study was 2.9%, as defined by a positive HCV antibody screen but negative HCV RNA. However, when risk factors for HCV infection are identified (e.g., IV drug use), a positive EIA is generally assumed to indicate HCV exposure and, if accompanied by a negative HCV RNA, are assumed to represent a cleared their HCV infection. In our study, most (6/7) of the false-positive cases had a prior history of IV drug use and have likely cleared HCV infection. This is the first published data on the false-positive rate for the HCV screening test in native Americans.

Hepatitis C is transmitted through direct contact with blood products and can lead to chronic infection and liver disease requiring transplantation. Before screening tests were available in 1992, infection resulted from transfusion with contaminated blood products. Today, infection is most likely to occur as a consequence of exposure to contaminated needles such as with IV drug

Table 2. HCV prevalence by age

Age	Overall (%)	n	HCV Antibody Prevalence (%)	n	95% CI	HCV RNA Prevalence (%)	n	95% CI
<29	24.3%	59	1.7%	1	-1.6–5.0	0.0%	0	–
30–39	18.5%	45	17.8%	8	6.6–29.0	13.3%	6	3.4–23.2
40–49	30.9%	75	16.0%	12	7.7–24.3	12.0%	9	4.7–19.4
50–59	17.3%	42	16.7%	7	5.4–28.0	14.3%	6	3.7–24.9
≥60	9.0%	22	0.0%	0	–	0.0%	0	–

Table 3. Risk factors by HCV status (prospective screening)

Factor	HCV Positive	HCV Negative	P Value	Odds Ratio	(95% CI)
Male	52.4%	31.2%	0.0243	2.4	0.9840–6.000
Intravenous drug or cocaine use	66.7%	25.6%	<0.0001	5.8	2.233–15.16
Old tattoos (>5 years)	38.1%	8.8%	<0.0001	6.3	2.338–17.24
Sexual partner with hepatitis C	19.0%	2.3%	0.0063	9.2	2.190–38.40
Alcoholism*	42.9%	21.4%	0.0132	2.8	1.094–6.941
Any transfusion	38.1%	17.2%	0.0175	2.7	1.041–6.971
Any tattoos	81.0%	56.7%	0.0270	3.2	1.031–9.743
Blood transfusion before 1992	23.8%	10.7%	0.0381	2.6	0.8739–7.787

* Alcoholism is defined by self-admission or an affirmative response to ≥3 CAGE questions[7]

abuse or, rarely, through nosocomial exposure.[14] Sexual transmission is thought to be uncommon, but has been implicated in 15–20% of cases.[1] Infection can also uncommonly occur by transmission from a pregnant mother to her newborn.[14]

Several practices in the native-American community may contribute to greater risk and prevalence of hepatitis C. There is concern about the frequency of use of IV drugs, a known risk factor for transmission of hepatitis C. Tattoos, particularly "homemade" ones, are common. In our study, tattoos did appear to be a risk, particularly those acquired >5 years ago (Table 3, $p<0.0001$). The Sun Dance ritual, a Sioux ceremony practiced by many Great Plains Indians, includes "flesh offerings," where ≥1 incisions are made into the skin of participants in the ceremony. While the Sun Dance ritual was performed with a single ceremonial knife in the past, many tribe-sponsored events now use sterile, surgical scalpels. In this study, participation in a Sun Dance ritual was not a significant factor.

Other HCV risk factors identified are similar to those previously described, with IV drug use being the most common (Table 3). A sexual partner with hepatitis C was more commonly reported in those with HCV infection, but this may not imply sexual transmission, as recent evidence suggests that monogamous sexual contact is an uncommon risk factor.[15] Many of those who screened positive for HCV had several risk factors.

In conclusion, prevalence of chronic hepatitis C in an urban adult native-American population was higher at 8.6% than that of the general U.S. population and higher in men than women. IV drug use remains the greatest risk factor for HCV infection, so screening for HCV should be performed with even a remote history of IV drug use, as recommended in other populations. However, tattoos may also contribute and be a more common potential risk in native-American communities.

Follow-up studies are needed in larger populations to confirm the risk of tattoos, to evaluate HCV prevalence in native Americans living on reservations and to formulate an improved education program. Little data are available on HCV genotype, barriers to receiving HCV care and response to HCV therapy in native Americans. These studies are also ongoing.

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