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Prevalence and Risk Factors Associated with Hepatitis C Virus Infection among Injection Drug Users in Puerto Rico

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INTRODUCTION

Hepatitis C infection has been recognized as a major health problem worldwide with an estimated 3% of the world population being infected (Roy, 2002). Throughout the world, injection drug users (IDUs) are the group at highest risk for hepatitis C virus (HCV) infection (Garten, 2004; Weissenbacher, 2003; Abdala, 2003; Alter, 1999; Trepo, 1999). Moreover, HCV infection has been shown to be rapidly acquired shortly after initiating injection practices (Garten, 2004; Alter and Moyer, 1998), and HCV appears to be transmitted parenterally with greater efficacy than the human immunodeficiency virus (HIV). Studies from numerous countries show high rates of infection with HCV among IDUs (Hagan, 1998; Roy, 2002), even in groups with low rates of HIV infection. In the United States, serologic testing for antibodies to HCV has shown that between 72% and 86% of IDUs tested have been exposed to HCV (Alter, 1999).

IDUs in Puerto Rico and among Puerto Ricans in the U.S. mainland have been shown to be at very high risk of infection with HIV. In contrast to other U.S. populations, including other Latino populations, injection drug use is the most common risk category for AIDS cases in Puerto Rico and among Puerto Ricans in the U.S. mainland (Diaz et al., 1993; Selik, Castro and Pappaioanou, 1988). Puerto Rico is one of the HIV epicenters of the United States, ranking sixth in AIDS incidence rates among all states and US territories (CDC, 2003). Moreover, Puerto Ricans are the Latino group with the highest prevalence of AIDS in the U.S. mainland. Recent epidemiological studies estimate an HIV seroprevalence rate of 20% among IDUs in Puerto Rico (Deren et al., 2001) and HIV seroincidence at a very high rate of 3.5 per 100 person years at risk (Deren et al., 2004). Moreover IDUs in Puerto Rico have been found to inject very frequently (six times a day on average), use the same syringe many times (an average of eight times), and to be more likely to share drugs, drug preparation materials, and inject in shooting galleries than IDUs in the U.S. mainland (Colón et al., 2001; Deren et al., 2001; Montoya et al., 1999). However, the extent to which HCV infection has spread among IDUs in Puerto Rico is not yet known.

METHODS

The sample's target population were injection drug users not in treatment, residing in communities of the metropolitan San Juan area in Puerto Rico. A total of 400 IDUs were recruited using a variety of outreach strategies. Ethnographic mapping strategies were used to identify drug markets (sites where drugs and injection supplies are sold and drugs are injected in communal shooting galleries) and other locations where drug users were known to hang out (e.g. vacant buildings, street corners). Because police intervention may cause drug markets to move suddenly, the mapping was updated monthly. Subjects were recruited based on a schedule of randomized visits to the identified sites. At predetermined sites and times, outreach workers approached a drug user, determined eligibility preliminarly, and invited the individual to participate. Individuals were considered eligible if they were at least 18 years of age, had injected drugs in the last 30 days, and had not been enrolled in drug treatment during the last 30 days. Visual examination for signs of recent venipuncture and urinalysis to detect morphine, cocaine, THC, Phencyclidine, and amphetamines (Abuscreen ONTRACK) were used to verify injection drug use.

An initial interview was conducted and participants were then offered HIV and HCV counseling and testing. HCV and HIV infections were detected by enzyme-linked immunosorbent assays (ELISA). ABBOTT HCV EIA 2.0 was used to detect antibodies to HCV (anti-HCV). Serum samples were analyzed by rLAV Enzyme-linked Inmunoassay (BIO RAD Laboratories EIA) for the detection of antibody to Human Immunodeficiency Virus Type 1 (HIV-1) and the results were confirmed by Western blot. Participants who tested positive were provided with information on easily-accessible clinics for HIV/AIDS care.

The survey instrument developed for the study collected detailed information on sociodemographic characteristics, lifetime and last 6-month drug use and HIV/HCV risk behaviors, health-related conditions, and drug treatment. Participants were compensated $20.00 for the time spent in the study interview. The study design, enrollment procedures, and survey instrument were approved by the Institutional Review Board (IRB) of the Universidad Central del Caribe, School of Medicine.

Frequency distributions and descriptive statistics were used to describe the study sample. Association between HCV infection and potential risk factors was assessed univariately by odds ratios and 95% confident intervals. Finally, a multiple logistic regression model using a backward elimination method was fitted to identify risk factors independently associated with HCV infection. All the variables used in the univariate analysis were included in the multiple logistic

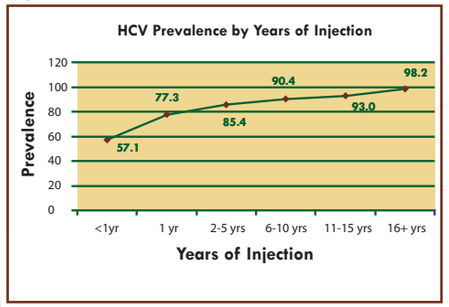
RESULTS

A description of the study sample is presented in Table 1. A total of 400 injection drug users were enrolled in the study. The sample was predominantly male (77.8%). The mean age was 32.8 years, with 39% of the study population between 25 to 34 years old. Almost 50% of the sample had not completed high school education. Mean number of years of injection was 11.6, with almost 60% of the sample reporting injecting during more than five years. The prevalence of HIV infection was 17.0%and the prevalence of anti-

Table 1 Description of the Study Sample

	N	%
OVERALL	**400**	**100**
Gender		
female	89	22.3
male	311	77.8
Age		
Mean age (SD) 32.8 (9.1)		
Less than 25 years old	92	23.0
25-34 years old	156	39.0
35 years old or more	152	38.0
Education		
<high school	191	47.9
completed high school	156	39.1
>high school	152	13.0
Years of drug injection		
Mean(SD) 11.6 (10.2)		
0-5 years	157	39.3
6-10 years	75	18.8
11-15 years	47	11.8
16 years or more	120	30.1
HIV infection status	64	17.0
HCV infection status	331	89.0

Figure 1



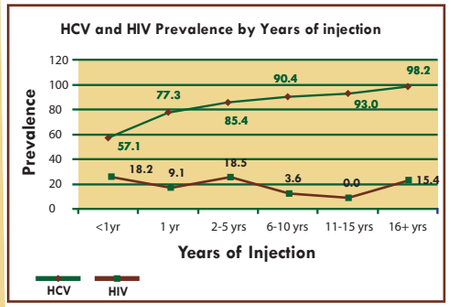


Figure 1 depicts the prevalence of HCV infection broken down by number of years of drug injection. Figure 1 shows a marked positive relationship between hepatitis C infection and the number of years of injection. Notably, IDUs who had initiated drug injection within the year prior to the study interview had an HCV infection rate of

Table 2 Univariate analysis of hepatitis C virus (HCV) infections among injection drug users.

Characteristic	n	Anti-HCV Positive %	Odds ratio	(95%CI)
Gender				
Female	60	81.1	1.0	
Male	271	90.9	2.3	(1.2,4.7)
Education				
<high school	165	90.7	1.0	
high school	126	88.7	0.8	(0.4,1.7)
>high school	40	85.1	0.6	(0.2,1.5)
Years of injection				
0-5 years	117	80.1	1.0	
6-10 years	66	90.4	2.3	(0.9,5.6)
11-15 years	40	93.0	3.3	(0.9,11.4)
16 years or more	107	98.2	13.3	(3.1,56.9)
HIV serostatus				
negative	266	87.5	1.0	
positive	59	95.2	2.8	(0.8,9.4)
Times injected in Jail (ever)				
None	190	84.4	1.0	
1-99 times	97	94.2	2.9	(1.2,7.3)
100 times or more	44	100.0	2.8 x 108	(0.0,--)
Times injected in shooting galleries (ever)				
None	18	72.0	1.0	
1-99 times	144	84.7	2.2	(0.8,5.7)
100 times or more	169	95.5	8.2	(2.7,25.3)
Times shared rinse water (ever)				
None	125	85.0	1.0	
1-99 times	164	90.6	1.7	(0.9,3.3)
100 times or more	41	95.3	3.6	(0.8,16.0)
Times shared cooker (ever)				
None	118	85.5	1.0	
1-99 times	161	89.4	1.4	(0.7,2.8)
100 times or more	52	96.3	4.4	(0.9,19.5)
Times backloading (ever)				
None	116	85.3	1.0	
1-99 times	170	89.0	1.4	(0.7,2.7)
100 times or more	45	100.0	2.8 x 108	(0.0,--)
Times shared needles (ever)				
None	169	86.2	1.0	
1-99 times	142	91.6	1.7	(0.9,3.5)
100 times or more	20	95.2	3.2	(0.4,24.8)
Casual sex partner (ever)				
None	98	90.7	1.0	
With condoms	50	86.2	0.6	(0.2,1.7)
Without condoms	183	88.8	0.8	(0.4,24.8)
Commercial sex partner (ever)				
None	257	90.2	1.0	
with condoms	35	85.4	0.6	(0.2,1.6)
Without condoms	39	84.8	0.6	(0.2,1.5)
STDs (ever)*				
No	278	87.4	1.0	
Yes	53	98.1	7.6	(1.1,56.7)
Tattoo (ever)				
No	90	76.9	1.0	
not in jail	71	89.9	2.7	(1.1,6.2)

* Include herpes simplex virus, syphilis and

Table 2 shows the HCV prevalence and unadjusted odds ratios for different characteristics and risk factors. Based on the univariate analysis, males were two times more likely to be anti-HCV positive than females. The seroprevalence of HCV was strongly associated with the number of years of injection. IDUs with more than 16 years of drug injection were 13 times more likely to be infected than IDUs with less than five years of injection. Participants who had injected drugs in a shooting gallery were eight times more likely to be infected than those who reported never injecting in a shooting gallery. IDUs who reported a history of STDs (i.e., herpes simplex virus, syphilis and gonorrhea) were seven times more likely to be anti-HCV positive than IDUs who reported no history of STDs. Individuals who had received tattoos while incarcerated were eight and a half times more likely to be HCV positive than those who

Table 3 Multiple logistic regression adjusted odds ratios for correlates of antibody to HCV among injection drug users.

Characteristics	Adjusted OR	95% CI	p value
Male	2.8	(1.2,6.8)	0.022
Years of injection			
6-10 years	1.2	(0.4,3.2)	0.735
11-15 years	2.6	(0.6,10.6)	0.184
16 years or more	13.6	(2.9,62.7)	0.001
Times ever injected in shooting galleries			
1-99 times	1.2	(0.4,4.1)	0.771
100 times or more	4.3	(1.1,16.9)	0.034
History of STDs**	10.6	(1.2,91.9)	0.032
History of Tattooing			
not in jail	2.7	(1.1,6.8)	0.036
in jail	9.6	(3.3,27.5)	0.001

+Backward elimination method
*Adjusted by all the variables included in table 2
** Include herpes simplex virus, syphilis and gonorrhea

Table 3 shows the results of the multiple logistic regression analysis. Using backward elimination, HCV infection remained positively associated with increasing years of injection, ever injecting in a shooting gallery, self reported history of STDs, and reports of tattoos done both outside and inside prisons.

Conclusions

- HCV prevalence is very high among injection drug users in Puerto Rico
- HCV infection is rapidly acquired in Puerto Rican drug users after initiating injection practices
- IDUs showed a greater risk of HCV infection with increasing years of injection
- IDUs who were HCV positive were more likely to be: homeless, speedball users, those who received tattoos in jail and those with a history of STDs (herpes simplex virus, syphilis and gonorrhea)
- None of the sexual risk behaviors were associated with HCV infection
- Results of this study indicate that more aggressive educational programs are urgently needed to reduce the spread of HCV infection among IDUs in Puerto Rico, especially in the incarcerated population

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