Published in final edited form as:
Drug Alcohol Depend. 2009 November 1; 105(1-2): 160–163. doi:10.1016/j.drugalcdep.2009.05.022.

Risk Behaviors after Hepatitis C Virus Seroconversion in Young Injection Drug Users in San Francisco

Judith I. Tsui[1], **Eric Vittinghoff**[2], **Judith A. Hahn**[3], **Jennifer L. Evans**[2], **Peter J. Davidson**[2], and **Kimberly Page**[2]

[1] Department of Medicine, Boston University School of Medicine, Boston MA

[2] Department of Epidemiology and Biostatistics, University of California, San Francisco

[3] Department of Medicine, San Francisco General Hospital, University of California, San Francisco

Abstract

Background—The rationale for screening populations at risk for hepatitis C virus infection (HCV) includes the possibility of altering risk behaviors that impact disease progression and transmission. This study prospectively examined young injection drug users (IDU) to determine if behaviors changed after they were made aware of HCV seroconversion.

Methods—We estimated the effects of HCV seroconversion coupled with post-test counseling on risk behaviors (alcohol use, non-injection and injection drug use, lending and sharing injecting equipment, and having sex without a condom) and depression symptoms using conditional logistic regression, fitting odds-ratios for immediately after disclosure and 6 and 12 months later, and adjusting for secular effects.

Results—112 participants met inclusion criteria, i.e. they were documented HCV seronegative at study onset and subsequently seroconverted during the follow-up period, with infection confirmed by HCV RNA testing. HCV seroconversion was independently associated with a decreased likelihood of consuming alcohol (OR=0.51; 95% CI: 0.27 to 0.97, p=0.04) and using non-injection drugs (OR=0.40; 95% CI: 0.20 to 0.81, p=0.01) immediately after disclosure, however, results were not sustained over time. There were significant ($p<0.05$) declines in the use of alcohol, injection and non-injection drugs, and sharing equipment associated with time that were independent from the effect of seroconversion.

Conclusions—Making young IDU aware of their HCV seroconversion may have a modest effect on alcohol and non-injection drug use that is not sustained over time.

Keywords

Hepatitis C virus; injection drug use; screening

1. Background

The incidence of hepatitis C virus (HCV) remains high (16–42% per year) among young injection drug users (IDU)(Edlin and Carden, 2006; Hahn et al., 2002). The rationale for screening populations at risk for HCV includes the possibility of altering risk behaviors that impact disease progression and transmission, but limited research exist to support this hypothesis (Chou et al., 2004). Some studies suggest healthier alcohol use and injecting

Corresponding author: Judith I. Tsui, MD MPH, 801 Massachusetts Ave, Rm 2078, Boston, MA 02118, Phone: (617) 414-6912, Fax: (617) 414-4676, Judith.tsui@bmc.org.

practices among patients who are aware that they are HCV-infected as opposed to those who are unaware (Kwiatkowski et al., 2002; McCusker, 2001; Nalpas et al., 2001; Tsui et al., 2007). However, a study of young IDU that examined drug use behaviors 6 months after disclosure of HCV test results failed to find any improvement (Ompad et al., 2002), and another cross-sectional study failed to find any association between awareness of HCV status and injecting behaviors (Cox et al., 2009). No studies have prospectively followed young IDU who HCV seroconvert to examine drug use and sexual behaviors before and after seroconversion.

This study sought to determine whether becoming HCV seropositive and receiving post-test counseling is associated with changes in drug use and sexual risk behaviors among young IDU. We examined whether awareness of seroconversion was associated with a reduction in alcohol, drug use, and sharing/lending of injecting equipment, and an increase in condom usage. In addition, in order to address the potential negative psychological consequences of being diagnosed with HCV, we also analyzed whether notification of seroconversion was associated with subsequent depressed symptoms.

2. Methods and Materials

2.1 Study Sample and Design

This study used observational data from the UFO study, a longitudinal cohort of young injection drug users (<30 years old) in San Francisco who were followed with quarterly interviews and blood sample collection. Details of its study design and methods have been published previously (Hahn et al., 2002). For this study, we restricted our sample to participants who had a documented HCV seroconversion followed by disclosure/post-test counseling during the study period. Study participants were recruited from January 2000 to June 2007, followed prospectively until February 20, 2008.

2.2 Study Outcomes

Outcome variables included alcohol use, injection drug use, sharing of injecting equipment and lending of syringes, non-injection drug use, and having sex without a condom. In addition, in order to examine the potential negative mental health effects of being told one was HCV positive, we examined symptoms of depression as measured by the 8-item version of the Center for Epidemiological Studies-Depression (CESD) Scale was used to assess symptoms of depression.(Melchior et al., 1993; Radloff, 1977) A score of ≥7 was used to define significant depressive symptomatology. All behaviors were assessed for the previous three months except for alcohol and injection drug use which were assessed for the previous month. Non-injection drug use was defined as use of cocaine, crack or marijuana (the most commonly used non-injection drugs). Sharing ancillary injecting equipment included any sharing of cookers, cotton, or water and lending syringes was defined as letting someone else use the participant's used syringe. Alcohol use was defined as any use (abstinence versus non-abstinence). All outcomes were assessed from self-reported data collected at interviewer-administered structured interviews.

2.3 Study Predictors

The primary predictor was disclosure of HCV seroconversion, followed by post-test counseling. Quarterly HCV testing included antibodies to HCV (anti-HCV) with enzyme immunoassays (EIA) (HCV EIA 2.0, Abbott Laboratories, Abbott Park, IL, or EIA-3, Ortho Clinical Diagnostics, Raritan NJ), as well as HCV RNA virus using transcription mediated amplification (TMA) technique (dHCV TMA assay component of the Procleix HIV-1/HCV assay, Gen-Probe Inc., San Diego, CA) to detect early HCV infection.(Hahn et al., 2002) All screening HCV EIA results were confirmed with HCV RNA testing, and testing was done at study visits by study personnel. Disclosure of HCV seroconversion was documented and

participants were provided post-test counseling. Counseling was provided by UFO Study counselors who were trained and certified in HIV test disclosure based on client-centered counseling policies of the California Department of Health Office of AIDS. For HCV testing disclosure, all UFO Study counselors received extensive training on interpretation of HCV test results, HCV natural history, and behaviors that impact disease progression and transmission. Pre- and post-test counseling was based on recommendations from the Centers for Disease Control(CDC, 1998), and information was provided regarding the need for a) preventing further harm to their liver (i.e. avoid alcohol) b) reducing risks for transmitting HCV to others (i.e. no lending/sharing of injecting equipment) and c) medical evaluation for liver disease and possible treatment. HIV prevention was emphasized to prevent co-infection. In addition to counseling to reduce risk of liver disease, HCV transmission, and co-infection with HIV, participants were offered vaccination for hepatitis A and B, and offered partner notification assistance.

Additional predictors, which were selected a priori included: age at baseline, gender, race, education, number of years of injection drug use, homelessness and incarceration within the previous three months.

2.4 Statistical Analysis

Baseline characteristics of the sample were assessed using simple tabulations and calculation of means and medians. We estimated the effects of HCV seroconversion and disclosure/counseling on risk behaviors and depression using conditional logistic regression. The rationale for this approach was to avoid confounding by differences between seroconverters and other study participants. In this type of matched case-control analysis, each participant serves as his/her own control, and behaviors before and after seroconversion are compared. The effect of HCV seroconversion on the log-odds of each outcome was modeled by a “jump” at the notification visit, followed by a linear trend across subsequent visits. We then computed the fitted odds-ratio for the effect of seroconversion at 6 and 12 months later. To control for confounding of the effect of HCV seroconversion by other covariates, we adjusted for other time-dependent covariates (use of alcohol and drugs, recent homelessness, and incarceration). We controlled for secular effects (changes over time) by including time since study entry, using a linear spline if fit was improved over a simple linear trend. Fixed subject-specific covariates (age, sex, race, etc.), which represent between- rather than within-subject differences, had no influence on the conditional parameter estimates. Because of the small sample size, we used restrictive model selection criteria, retaining covariates if they had a p-value<0.15 or their inclusion resulted in a >3% change in the seroconversion effect estimate. We checked for departures from linearity of trend in the seroconversion effect across subsequent post-conversion visits, and for collinearity between predictors. All statistical analyses were conducted using Stata version 10.0 (College Station, TX, USA).

3. Results

From the 1,223 young IDU that were screened, 555 individuals were enrolled and 403 were prospectively followed. Of those 403, 112 participants met inclusion criteria and were included in this study, i.e. they were documented HCV seronegative at study onset, subsequently seroconverted during the follow-up period. Participants who were included in the analysis tended to be slightly younger than those who were excluded from the analysis (mean age 22 (±3) versus 23 (±3), p-value<0.01), otherwise there were no significant differences in any of the other variables examined. Participants included in this study were predominantly Caucasian males who injected heroin (Table 1). Most participants acknowledged using non-injection drugs (87%) and drinking alcohol (78%) at baseline. A substantial percentage of participants reported being recently (prior 3 months) homeless (72%) or incarcerated (31%). The median

follow-up was 1.8 years (IQR: 1.7 to 4.8). Among the 112 participants there were a total of 758 visits during which risk behaviors were assessed: 441 visits occurred prior to seroconversion and 317 occurred afterwards. The median number of follow-up visits pre-serconversion was 7 (IQR: 4–12), the median number post-seroconversion was 5 (IQR: 3–11).

In our analysis using conditional logistic models, we found that HCV disclosure after seroconversion was independently associated with immediate declines in use of alcohol and non-injection drugs (Table 3). However, the reductions became smaller over time (trend p-value for alcohol=0.02, for non-injection drug use=0.13). In contrast, while we found little evidence for an immediate decline in lending syringes due to seroconversion, this was the only behavior that consistently diminished over time in association with seroconversion and approached statistical significance at one year; however, the time trend was not statistically (p-value=0.24). HCV seroconversion was not associated with changes in injection drug use, sharing of equipment or condom use, nor was it associated with depression. Most behaviors declined over time, independent of the HCV seroconversion effect: we observed statistically significant ($p<0.05$) declines in the use of alcohol, injection as well as non-injection drugs, and sharing of ancillary injecting equipment, independent of the HCV seroconversion effect (data not shown). Our analysis of the correlation of covariates showed that while time since study entry was moderately strongly correlated with both having seroconverted (0.46) and time since seroconversion (0.62), this did not reach the level of collinearity to prevent us from examining their effects simultaneously. Finally, adjusting HIV seroconversion (of which there were only 3 known cases) did not substantially impact results.

4. Discussion

In this study of young IDU, we found that HCV seroconversion was associated with a decreased likelihood of consuming alcohol and using non-injection drugs immediately after disclosure of results and post-test counseling. However, improvements in behaviors were not sustained at 6 months and 12 months. There was no statistically significant change in injection drug use and injecting behaviors after seroconversion and post-test counseling, though there was a non-significant trend toward decreased lending of syringes. Finally, there was no indication that depression symptoms were increased after becoming aware of their HCV infected status.

The finding that injection drug use and injecting behaviors were not significantly affected by HCV seroconversion and post-counseling is similar to a prior study of young IDU in Baltimore that looked at behaviors 6 months after HCV testing and found that those who had tested positive had no change in injecting behaviors.(Ompad et al., 2002) Our study, in contrast, did show mild improvements in reported alcohol use immediately after becoming aware of HCV seroconversion, though these improvements were not sustained at 6 months. These results suggest that screening and providing post-test counseling for HCV in young IDU is insufficient for changing long-term behaviors. Evidence from the HIV prevention literature supports the supposition that testing and education alone are insufficient to change behaviors(Calsyn et al., 1992), and that more targeted behavioral interventions are needed to generate sustained reductions in high-risk behaviors in IDU.

There were limitations to this study. It is important to note that the data were collected as part of a study whose primary goal was to detect and assess rates and correlates HCV seroconversion, and was not designed to study the impact of HCV screening and post-test counseling on behaviors. However, in lieu of a randomized controlled study of HCV screening in IDU which has never been conducted (and is likely impossible due to ethical considerations), this type of secondary data analysis can provide some insights. The relatively modest sample size and follow-up time were limitations to the study power. Furthermore, the moderately

strong correlations of time since study entry with seroconversion as well as time since seroconversion did reduce power to assess these effects, so that our negative finding must be interpreted with caution. Our study was based on self-reported behaviors, and therefore may reflect socially desirable responses rather than actual behaviors, in particular since study personnel who assessed risk behaviors also disclosed test results and provided counseling.

In summary, this observational study of young IDU found modest improvements in reported alcohol and non-injection drug use immediately after disclosure of HCV serconversion and receipt of post-test counseling, however, those improvements were not sustained over time. On the other hand, we found no evidence that patients became more depressed after learning that they had newly acquired HCV. While these results do not demonstrate that HCV testing and counseling have a major influence on risk behaviors on individuals who seroconvert, they do lend some evidence against substantial harm. More studies are needed to identify and implement effective interventions to reduce high-risk behaviors in young IDU who become HCV infected.

Bibliography

Calsyn DA, Saxon AJ, Freeman G Jr, Whittaker S. Ineffectiveness of AIDS education and HIV antibody testing in reducing high-risk behaviors among injection drug users. Am J Public Health 1992;82:573–575. [PubMed: 1546776]

CDC. Recommendations for prevention and control of hepatitis C virus (HCV) infection and HCV-related chronic disease. Centers for Disease Control and Prevention. MMWR Recomm Rep 1998;47:1–39.

Chou R, Clark EC, Helfand M. Screening for hepatitis C virus infection: a review of the evidence for the U.S. Preventive Services Task Force. Ann Intern Med 2004;140:465–479. [PubMed: 15023713]

Cox J, Morissette C, De P, Tremblay C, Allard R, Graves L, Stephenson R, Roy E. Access to sterile injecting equipment is more important than awareness of HCV status for injection risk behaviors among drug users. Subst Use Misuse 2009;44:548–568. [PubMed: 19242863]

Edlin BR, Carden MR. Injection drug users: the overlooked core of the hepatitis C epidemic. Clin Infect Dis 2006;42:673–676. [PubMed: 16447113]

Hahn JA, Page-Shafer K, Lum PJ, Bourgois P, Stein E, Evans JL, Busch MP, Tobler LH, Phelps B, Moss AR. Hepatitis C virus seroconversion among young injection drug users: relationships and risks. J Infect Dis 2002;186:1558–1564. [PubMed: 12447730]

Kwiatkowski CF, Fortuin Corsi K, Booth RE. The association between knowledge of hepatitis C virus status and risk behaviors in injection drug users. Addiction 2002;97:1289–1294. [PubMed: 12359033]

McCusker M. Influence of hepatitis C status on alcohol consumption in opiate users in treatment. Addiction 2001;96:1007–1014. [PubMed: 11440611]

Melchior LA, Huba GH, Brown VB, Reback CJ. A short depression index for women. Education and Psychological Measurement 1993;53:1117–1125.

Nalpas B, Martin S, Fontaine H, Fabbro-Peray P, Brechot C, Pol S. Impact of medical recommendations on alcohol consumption in HCV positive patients. J Hepatol 2001;35:312–313. [PubMed: 11580161]

Ompad DC, Fuller CM, Vlahov D, Thomas D, Strathdee SA. Lack of behavior change after disclosure of hepatitis C virus infection among young injection drug users in Baltimore, Maryland. Clin Infect Dis 2002;35:783–788. [PubMed: 12228813]

Radloff L. The CES-D scale: a self-report depression scale for research in the general population. Applied Psychol Meas 1977;1:385–401.

Tsui JI, Saitz R, Cheng DM, Nunes D, Libman H, Alperen JK, Samet JH. Awareness of hepatitis C diagnosis is associated with less alcohol use among persons co-infected with HIV. J Gen Intern Med 2007;22:822–825. [PubMed: 17503108]

Table 1

Baseline Characteristics of the Sample of Young IDU with HCV Seroconversion (n=112)

z	number (%)[a] or mean (SD)
Age	22(±3)
Female	38 (34%)
Non-white	24 (21%)
High School Graduate	53 (48%)
HIV Positive	4 (4%)
Primary Injecting Drug	
Heroin	61 (59%)
Speed	29 (28%)
Other	13 (13%)
Non-injection Drug Use within Past 3 Months[b]	90 (87%)
Homelessness within Past 3 Months	73 (71%)
Incarceration within Past 3 Months	33 (32%)
Drank Alcohol Past Month	80 (78%)
Days Drank Past Month	11 (±11)

[a] Numbers and percentages may not sum perfectly due to missing data

[b] Use of marijuana, crack or other cocaine

Table 2

Adjusted Relative Odds for Behaviors/Depression Associated with Awareness of HCV Seroconversion in 112 Young IDU Who Seroconverted Using Conditional Logistic Regression[a]

	Immediately After Serconversion[b]			6 months After Seroconversion			12 months After Seroconversion		
	OR	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**
Past Month Alcohol Use	**0.51**	**0.27 to 0.97**	**0.04**	0.66	0.35 to 1.23	0.19	0.84	0.42 to 1.65	0.61
Past Month Injection Drug Use	0.84	0.35 to 2.05	0.7	0.85	0.36 to 1.98	0.71	0.86	0.33 to 2.20	0.75
Past 3 Month Noninjection Drug Use	**0.4**	**0.20 to 0.81**	**0.01**	**0.48**	**0.23 to 1.00**	**0.05**	0.57	0.25 to 1.32	0.19
Past 3 Month Lending of Syringes	0.77	0.28 to 2.13	0.61	0.48	0.20 to 1.13	0.09	0.3	0.08 to 1.08	0.07
Past 3 Month Sharing of Injecting Equipment	0.61	0.22 to 1.71	0.35	0.6	0.23 to 1.58	0.3	0.59	0.15 to 2.30	0.45
Past 3 Month Sex without Condom	1.65	0.77 to 3.58	0.2	1.57	0.72 to 3.40	0.26	1.48	0.63 to 3.48	0.37
Current Depression	0.76	0.23 to 2.53	0.65	0.78	0.28 to 2.16	0.63	0.8	0.19 to 3.29	0.76

[a] Adjusted for secular trends plus drug use, recent incarceration and homelessness; fixed covariates (age, sex, race, etc.), which represent between- rather than within-subject differences, have no influence in the conditional logistic model.

[b] OR for behavior immediately after seroconversion; model assumes change at seroconversion followed by linear trend

Drug Alcohol Depend. Author manuscript; available in PMC 2010 November 1.