



Prevalence and correlates of hepatitis C infection among users of North America's first medically supervised safer injection facility

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Summary Background: North America's first medically supervised safer injection facility (SIF) for illicit drug users was opened in Vancouver, Canada on 22 September 2003. We examined the prevalence and correlates of hepatitis C (HCV) infection among a representative cohort of SIF users.

Methods: Users of the Vancouver SIF were selected at random and asked to enrol in the Scientific Evaluation of Supervised Injecting (SEOSI) cohort. At baseline, venous blood samples were collected and an interviewer-administered questionnaire was performed. Participants who were HCV-positive were compared with HCV-negative subjects using bivariate and logistic regression analyses.

Results: Between 1 December 2003 and 30 July 2004, 691 participants were enrolled into the SEOSI cohort, among whom 605 (87.6%) were HCV-positive at baseline. Factors independently associated with HCV infection in logistic regression analyses included: involvement with the sex trade [adjusted odds ratio (AOR) 3.7, 95% confidence interval (CI) 2.1-6.1], history of borrowing syringes (AOR 1.8, 95%CI 1.1-2.9), and history of incarceration (AOR 2.6, 95%CI 1.5-4.4). Daily heroin use was protective against HCV infection (AOR 0.6, 95%CI 0.3-0.9).

Conclusion: The SIF has attracted injection drug users with a high burden of HCV infection and a substantial proportion of uninfected individuals. Although cross-sectional, this study provides some insight into historical risks for HCV infection among this population, and prospective follow-up of this cohort will be useful to determine if use of the SIF is associated with reduced risk behaviour and HCV incidence.

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Introduction

A growing dialogue has recently emerged regarding the potential of conventional public health efforts to stem the spread of hepatitis C (HCV) among injection drug users (IDUs).¹ While it is evident that greater attention should be focused on the prevention of injection,² there remains an urgent need for novel interventions for the prevention of blood-borne disease transmission among active IDUs. For instance, while HCV may spread rapidly among IDUs,³ recent studies have indicated that there is a measurable period over which interventions may be effective for preventing the spread of HCV,⁴ but that current approaches to prevention have several shortcomings.⁵

In several European cities and, more recently, in Sydney, Australia, safer injection facilities (SIFs), where IDUs can inject pre-obtained illicit drugs, have been implemented in an effort to reduce the public health impacts of injection drug use including blood-borne disease transmission.⁶ Within SIFs, IDUs are typically provided with sterile injecting equipment, emergency care in the event of overdose, primary care services and referral to addiction treatment.^{7,8} While several process reports and qualitative examinations of SIFs exist, there are few epidemiological investigations of HCV infection levels among representative cohorts of SIF users in the scientific literature.⁹⁻¹²

On 22 September 2003, North America's first government-sanctioned SIF pilot study was opened in Vancouver, Canada.¹² Although impacts of the SIF on certain outcomes, such as blood-borne infection incidence, will require several years to assess, it is now possible to examine the prevalence of HCV infection among users of the SIF. Therefore, the present study was conducted to examine the prevalence and correlates of HCV infection among users of the Vancouver SIF.

Methods

The Vancouver SIF, known as InSite, is centrally located in Vancouver's Downtown Eastside (DTES), which is the most impoverished urban neighbourhood in Canada and home to well-documented overdose and infectious disease epidemics among the estimated 5000 IDUs that reside there.^{13,14} The Scientific Evaluation of Supervised Injecting (SEOSI) cohort has been described in detail previously.¹⁵ Briefly, the SEOSI cohort is based on a representative sample of InSite users.

The sample was derived through random recruitment of InSite users who were offered an informed consent to enrol into the study. Of note, as of 24 August 2004, 3036 different individuals had used the facility. Random recruitment involves using random number generation to select 2-h blocks of time during the hours that InSite is open (between 10:00 a.m. and 4:00 a.m.). During these times, users of the SIF are invited to enrol in the SEOSI study, and a nominal financial incentive (\$20 CDN) is offered to those who attend the research site, which is approximately one block away from InSite. Among individuals who wish to enrol in the SIF evaluation and who provide informed consent, a venous blood sample is drawn and an interviewer-administered questionnaire is conducted. The SEOSI cohort has been ethically approved by the University of British Columbia/Providence Healthcare Research Ethics Board.

The primary endpoint in the present study was the prevalence of HCV-antibody positivity at the baseline visit among SEOSI participants, and we were primarily interested in factors associated with baseline HCV positivity in the cohort. Blood samples were tested for hepatitis C infection at the British Columbia Centre for Disease Control's laboratory in Vancouver. We examined factors potentially associated with HCV infection including: gender, ethnic background (Aboriginal vs other), age, daily cocaine injection (yes vs no), daily heroin injection (yes vs no), current use of methadone maintenance therapy (yes vs no), history of involvement in the sex trade (yes vs no), history of borrowing used syringes (yes vs no), history of sharing other injecting equipment, including spoons, cookers, filters, cotton or plungers (yes vs no), history of shooting gallery use (yes vs no), history of requiring help with injections (yes vs no), history of incarceration (yes vs no), and residence in the DTES HIV epicentre (yes vs no). For reasons described previously,³ years injecting was not considered because of its collinearity with the age variable.

Variables potentially associated with HCV infection were examined in bivariate analyses using Pearson's Chi-square test and the Wilcoxon rank sum test. In addition, logistic regression was used to examine independent factors associated with HCV infection. The multivariate model was fitted using an a priori defined model-building approach in which we adjusted for all variables that were statistically significant at the $P < 0.05$ level in the bivariate analyses. All statistical analyses were performed using SPSS Version 12.0. All P values were two sided (Tables 1 and 2).

Table 1 Prevalence of hepatitis C stratified by sociodemographic and behavioural variables.

| Characteristic | HCV negative <i>n</i> (%) | HCV positive <i>n</i> (%) | Odds ratio (95% CI) | <i>P</i> value |
|---------------------------------------|---------------------------|---------------------------|---------------------|----------------|
| Gender | | | | |
| Male | 67 (77.9) | 424 (70.1) | | |
| Female | 19 (22.1) | 181 (29.9) | 0.66 (0.39-1.14) | 0.136 |
| Ethnicity | | | | |
| Other | 74 (86.0) | 494 (81.7) | | |
| Aboriginal | 12 (14.0) | 111 (18.3) | 1.39 (0.73-2.64) | 0.321 |
| Age | | | | |
| Median (interquartile range) | 33.5 (12.4) | 39.9 (11.3) | 39.07 (11.84)* | <0.001* |
| Daily cocaine injection ^a | | | | |
| No | 57 (66.3) | 409 (67.6) | | |
| Yes | 29 (33.7) | 196 (32.4) | 0.94 (0.58-1.52) | 0.806 |
| Daily heroin injection ^a | | | | |
| No | 29 (33.7) | 313 (51.7) | | |
| Yes | 57 (66.3) | 292 (48.3) | 0.48 (0.30-0.76) | 0.002 |
| On methadone ^a | | | | |
| No | 77 (89.5) | 469 (77.5) | | |
| Yes | 9 (10.5) | 136 (22.5) | 2.48 (1.21-5.08) | 0.013 |
| Involved in sex trade ^b | | | | |
| No | 65 (75.6) | 360 (59.5) | | |
| Yes | 21 (24.4) | 245 (40.5) | 2.11 (1.26-3.54) | 0.005 |
| Borrowing syringes ^b | | | | |
| No | 52 (60.5) | 249 (41.2) | | |
| Yes | 34 (39.5) | 356 (58.8) | 2.19 (1.38-3.47) | 0.001 |
| Borrowing equipment ^b | | | | |
| No | 39 (45.3) | 255 (42.1) | | |
| Yes | 47 (54.7) | 350 (57.9) | 1.14 (0.72-1.79) | 0.575 |
| History of shooting gallery use | | | | |
| No | 11 (12.8) | 69 (11.4) | | |
| Yes | 75 (87.2) | 536 (88.6) | 1.14 (0.58-2.25) | 0.707 |
| Require help injecting ^b | | | | |
| No | 25 (29.1) | 156 (25.8) | | |
| Yes | 61 (70.9) | 449 (74.2) | 1.18 (0.72-1.94) | 0.517 |
| History of incarceration ^b | | | | |
| No | 30 (34.9) | 104 (17.2) | | |
| Yes | 56 (65.1) | 501 (82.8) | 2.58 (1.58-4.22) | <0.001 |
| Reside in DTES ^a | | | | |
| No | 35 (40.7) | 184 (30.4) | | |
| Yes | 51 (59.3) | 421 (69.6) | 1.57 (0.99-2.50) | 0.057 |

HCV, hepatitis C virus; DTES, Downtown Eastside.

^a Current activity.^b Ever.

Results

Between 1 December 2003 and 30 July 2004, 904 participants were randomly invited to enrol into the SEOSI study, among whom 735 (81.3%) had decided to attend the external research site to learn about participation in the SIF evaluation by 30 July 2004. Overall, five IDUs were deemed by research staff to be unfit to provide informed consent and were not enrolled, and 15 decided not to enrol into the study after learning about what cohort participation would require. Therefore, 713 individuals were

recruited into the SEOSI cohort during the study period, among whom 22 (3%) had to be excluded since a venous blood sample could not be drawn and the results of dry blood spot testing were unavailable. Among the remaining 691 individuals, 605 (87.6%) were found to be infected with HCV at baseline.

In bivariate analyses, baseline HCV infection was positively associated with older age ($P < 0.001$), being currently on methadone ($P = 0.013$), having a history of involvement in the sex trade ($P = 0.005$), having a history of borrowing syringes ($P = 0.001$),

Table 2 Multivariate logistic regression analysis of factors associated with baseline hepatitis C virus infection.

| Characteristic | Adjusted odds ratio | 95% CI | P value |
|--------------------------|---------------------|-----------|---------|
| Daily heroin use | | | |
| Yes vs no | 0.55 | 0.33-0.93 | 0.025 |
| Involvement in sex trade | | | |
| Yes vs no | 3.69 | 2.06-6.12 | <0.001 |
| Borrowing syringes | | | |
| Yes vs no | 1.78 | 1.08-2.92 | 0.024 |
| History of incarceration | | | |
| Yes vs no | 2.56 | 1.49-4.39 | 0.001 |

CI, confidence interval. Variables shown in the model above were also adjusted for age.

and having a history of incarceration ($P < 0.001$). Gender, ethnicity, cocaine injection, borrowing injection equipment other than syringes, history of shooting gallery use, requiring help with injections, and residing in the DTES HIV epicentre were non-significant.

Factors independently associated with HCV infection in logistic regression analyses included: involvement in the sex trade [adjusted odds ratio (AOR) 3.7, 95% confidence interval (CI) 2.1-6.1], history of borrowing syringes (AOR 1.8, 95%CI 1.1-2.9), and history of incarceration (AOR 2.6, 95%CI 1.5-4.4). Daily heroin use was protective against HCV infection (AOR 0.6, 95%CI 0.3-0.9).

Discussion

In the present study, we found that the prevalence of HCV among users was 88% and that factors associated with HCV infection among this population included involvement in the sex trade, history of borrowing syringes, and history of incarceration, whereas daily heroin use was protective against HCV infection.

Given what is known about the transmission rates of HCV infection among IDUs,^{1,16} historical rates of HCV infection in this community,³ and that the majority of SEOSI participants in the present study provided a venous blood sample <1 year after the SIF opened, the present study is essentially measuring historical risk factors for HCV infection in this community. Specifically, it is likely that all HCV infections in the present study were acquired a number of years before the SIF opened. The present analyses are informative as while some of the risk factors, such as syringe borrowing, may be amenable

to improvement through the provision of a hygienic space for injection drug use, other factors such as incarceration may not. With regards to this, while the present study is limited due to its cross-sectional nature, we have recently demonstrated high rates of syringe sharing associated with being incarcerated among IDUs in this setting.¹⁷ The association between involvement in the sex trade and HCV infection is likely to be due to the fact that many sex-trade workers are street-based and may inject in environments where there have traditionally been challenges with the delivery of sterile injecting equipment,^{5,18} and it is noteworthy that we have previously shown that the sex trade is independently associated with syringe sharing among Vancouver sex-trade workers.¹⁹ Prospective follow-up of the HCV-negative individuals in the SEOSI cohort will be important to examine if the provision of a street-based low threshold space for obtaining sterile equipment and injecting will help to reduce the burden of HCV among sex-trade workers. Finally, it is interesting that daily heroin use was protective against HCV infection. We expect this is due to the fact that, historically, the primary risk factor for HCV incidence in this community has been daily cocaine injection, and daily heroin injectors may be less likely to engage in this risk behaviour; however, prospective incidence studies will be required to investigate this question.²⁰

Given the high baseline prevalence of HCV infection in the community prior to the opening of InSite, it is clear that the public health approach being applied in Vancouver, with regard to this infection, is one of containment. Specifically, the major potential benefit with regard to HCV incidence levels in the community is that a significant number of HCV-infected individuals are using a space in which syringe lending is precluded due to the provision of sterile injecting equipment and the supervision of nurses. It is also noteworthy that significant educational opportunities exist within the SIF, and it will be important to examine if those exposed to public health education within the SIF report lower rates of syringe lending and borrowing outside the SIF. Other endpoints of interest, given the high burden of HCV infection among this population, will be to examine if exposure to the medical care within InSite will be associated with elevated referral rates for HCV care.¹²

This study has several limitations. Most importantly, it is limited by its cross-sectional study design. Unfortunately, sufficient HCV-negative individuals will have to be recruited and followed longitudinally before an examination of HCV incidence will be possible. A second limitation is that we are likely to have underestimated rates of syringe

borrowing and other behaviours that have been subject to socially desirable reporting.²¹ Finally, as noted above, the majority of participants were already HCV-infected, leaving a small number of HCV-negative participants in the control group. As such, there may have been limited statistical power to identify some risk factors for HCV infection.

In summary, we found that the prevalence of HCV among users of North America's first SIF was 88%. The present study also identified several historical risk factors for HCV infection among the population of IDUs that have initiated SIF use, such as syringe borrowing and involvement in the sex trade, which may be amenable to improvement through the availability of the SIF in the community. Given the high prevalence of HCV infection among InSite users, it is clear that the public health approach being applied in Vancouver, with regard to this infection, is one of containment. Prospective evaluation of HCV-infected individuals will be useful to examine if exposure to the medical facilities at InSite will engage HCV-positive IDUs into HCV care, and examination of baseline HCV-negative IDUs will be useful to determine if use of the SIF is associated with reduced rates of HCV transmission.

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