

Prevalence of HIV and hepatitis C virus infections among inmates of Quebec provincial prisons

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ABSTRACT

Background: To determine the prevalence of HIV and hepatitis C virus (HCV) infections and examine risk factors for these infections among inmates in Quebec provincial prisons.

Methods: Anonymous cross-sectional data were collected from January to June 2003 for men ($n = 1357$) and women ($n = 250$) who agreed to participate in the study and who completed a self-administrated questionnaire and provided saliva samples.

Results: The prevalence of HIV infection was 2.3% among the male participants and 8.8% among the female participants. The corresponding prevalence of HCV infection was 16.6% and 29.2%, respectively. The most important risk factor was injection drug use. The prevalence of HIV infection was 7.2% among the male injection drug users and 0.5% among the male non-users. Among the women, the rate was 20.6% among the injection drug users, whereas none of the non-users was HIV positive. The prevalence of HCV infection was 53.3% among the male injection drug users and 2.6% among the male non-users; the corresponding values among the women were 63.6% and 3.5%.

Interpretation: HIV and HCV infections constitute an important public health problem in prison, where the prevalence is affected mainly by a high percentage of injection drug use among inmates.

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People admitted to correctional facilities often have a history of injection drug use, needle-sharing and high-risk sexual behaviours.^{5,7,9,15} The practice of such risky behaviours is frequently continued during incarceration,^{5,9,10,15-17} along with other potentially risky activities, such as being tattooed.^{5,7,8,16} To date, there has been limited information regarding the burden of HCV infection among inmates of provincial prisons in Quebec, where HIV and HCV testing is available to inmates only on request. Better knowledge of infection rates would help disease prevention and management program planning.

We sought to determine the prevalence of HIV and HCV infections among inmates in 7 provincial prisons in Quebec and to identify risk factors associated with prevalent HCV infection in this population.

Methods

Background

We selected 7 provincial prisons from a total of 17 in the province of Quebec, to represent a diversity of settings. Of the 5 men's prisons, 1 was in Montréal, 1 was in Québec City, and 3 were in smaller cities in the eastern, western and northern regions of the province. The 2 women's prisons were both in urban settings (Québec City and Montréal). The total capacity of the participating prisons was 2077 beds for men and 162 beds for women, thus representing 52% of all 4303 beds in the Quebec network of provincial detention centres. On admission, information such as name, length of sentence and date of release is recorded in each prison's computer database.

From the Unité de recherche en santé des populations (Poulin, Alary, Godin, Landry, Demers, Morarescu), Centre hospitalier *affilié* universitaire de Québec; Département de médecine sociale et préventive (Alary), Université Laval, Québec; Institut national de santé publique du Québec (Alary, Lambert, Rochefort, Claessens), Québec and Montréal; Direction régionale de santé publique de Montréal-Centre (Lambert), Montréal; Chaire de recherche du Canada sur les comportements et la santé (Godin), Université Laval, Québec; Faculté des sciences infirmières (Godin, Gagnon), Université Laval, Québec; Laboratoire de Santé publique du Québec (Rochefort, Claessens), Sainte-Anne-de-Bellevue, Que.

In the province of Quebec, as elsewhere, HIV and hepatitis C virus (HCV) infections in incarcerated populations are of concern to public health and correctional service authorities.¹⁻³ Many studies have shown that the prevalence of HIV infection is higher in the incarcerated population than in the general population,⁴⁻⁷ and more recently other studies have shown that a greater proportion of inmates are infected with HCV than with HIV.⁸⁻¹⁴

Study population

All male inmates with a period of incarceration of more than 24 hours who were on the computer list the day before the data-collection period in each of the participating prisons were eligible for inclusion. The data collection for men was carried out one prison at a time and took place from January to June 2003. We excluded inmates considered by the prison staff to pose a danger to the survey team.

The study population was similarly defined for women. However, to achieve a sufficiently large sample, we used the computer list from 3 (in Montréal) or 2 (in Québec City) different days at 2-month intervals between January and June 2003. No woman was recruited more than once in the study.

Data collection

During the data collection period, a correctional officer, specially hired for the study, used the computer list to identify eligible inmates and invite them to meet an interviewer. As a token of appreciation, a deposit of \$10 was made in the personal account of inmates who agreed to meet the interviewer. They were met in a private room where they were advised of the study's objectives. Informed consent was obtained, and only the research interviewer knew who had refused to participate. Information on how to get confidential counselling and testing, both outside and inside prison, was provided to all.

Participants were asked to complete a short, anonymous, self-administered questionnaire about their sociodemographic characteristics and HIV/HCV risk behaviours, both outside and inside prison. The questionnaire was initially developed in French, translated into English and then translated back to French to ensure consistency. The interviewer was available to provide clarification and to help fill in the questionnaire if necessary.

Two samples of saliva were collected from each participant with the use of the OraSure device (OraSure Technologies Inc., Beaverton, Ore.). All samples were sent to the Laboratoire de santé publique du Québec, where they were tested for HIV and HCV antibodies. No identifier was recorded on the questionnaire or on the saliva specimens, but a sticker with a nonidentifying code number, covered by a second opaque sticker, was placed on both saliva tubes and the questionnaire, to link the laboratory results with the questionnaires.

Laboratory procedures

HIV antibodies were detected with the use of the Vironostika HIV-1 Microelisa System (BioMérieux, Durham, NC). Samples initially showing positive results for HIV were retested in duplicate and were declared positive if at least 2 of the 3 results were positive.¹⁸ For the detection of HCV antibodies, a modified commercial kit — Ortho HCV 3.0 ELISA Test System (Ortho Clinical Diagnostics Inc., Raritan, NJ)¹⁹ — was used.

Statistical analysis

The prevalence of HIV and HCV infections and 95% confidence intervals (CIs) were calculated separately for men and

women. Prevalence odds ratios (ORs) were used as the measure of association between risk factors and infections. Because HIV epidemiology in prisons is relatively well known, the analysis focused on HCV prevalence and associated risk factors. In the univariate analysis we used the χ^2 test for categorical variables and Student's *t* test for continuous variables. We used logistic regression for multivariable analysis. Statistical significance was set at a 5% alpha level (2-tailed).

Ethical considerations

This study was approved by the ethics committees of both the Centre hospitalier *affilié* universitaire de Québec and Laval University, Québec. This project also received the support of the president of the Montréal Inmates' Rights Organisation.

Results

Study participants

A total of 1607 inmates (1357 men and 250 women) agreed to participate in the study. Among the women, the total number of participants exceeded the number of beds because of multiple periods of recruitment and no refusals. Among the men, the number of participants represents 65.3% of the total potential number. Nonparticipation was due mainly to the limited number of time slots for recruitment and logistical arrangements with the authorities of each prison. The precise number of refusals is not known, but it was less than 20.

The men were younger than the women on average (mean age 33.3 v. 35.5 years; $p < 0.001$), and 63% of the participants did not complete high school. Most of the participants were French Canadians, but there were more English Canadian women than men (13.2% v. 4.9%; $p < 0.001$). Aboriginal people represented 4.1% and 4.8% of the male and female participants, respectively, whereas 12.2% of the men and 4.8% of the women were of other ethnocultural groups (Haitian, Hispanic and African).

History of incarceration

Male participants had been incarcerated for longer than the women on average (mean duration of detention at study enrolment 100.8 v. 60.0 days, $p < 0.001$; mean duration of sentence 332.1 v. 289.5 days, $p < 0.001$). Women more often than men were recidivists (mean number of incarcerations per inmate 7.6 v. 6.4; $p < 0.001$), but examination of accumulated durations of previous sentences revealed that the men had been incarcerated for longer than the women (mean total duration of incarceration, 40.5 v. 26.0 months; $p < 0.001$).

Risk behaviours

Table 1 shows the high level of risk behaviours outside and inside prison. More women than men reported risky sexual behaviour, injection drug use, and tattooing and piercing outside prison, but more men than women reported injection drug use and tattooing while inside prison. In addition, 156 men (11.5%) and 6 (2.4%) women reported performing tattooing or piercing on other inmates while inside prison, among whom 76.3% ($n = 119$) and 50% ($n = 3$),³ respectively, reported having done so with sterile equipment.

HIV and HCV prevalence and associated risk factors

The overall prevalence of HIV infection was 3.4% (54/1607); it was significantly higher among the women than among the men (8.8% [22/250] v. 2.4% [32/1357], $p < 0.001$) (Table 2). The overall prevalence of HCV infection was 18.5% (298/1607); among the women and men it was 29.2% (73/250) and 16.6% (225/1357), respectively ($p < 0.001$). HIV and HCV infections mainly affected injection drug users. Most of the HIV-positive men (68.8%) and women (59.1%) also had HCV infection. There was no statistically significant difference in HIV and HCV prevalence according to the location of the detention centres (data not shown). Twenty percent of the HIV-positive inmates (11/54) and 40% of the HCV-positive inmates (119/298) did not know their serostatus (reported their last test results as negative or unknown, or had never been tested).

Among the participants who reported injection drug use, the risk factors independently associated with prevalent HCV infection were being female (prevalence OR 1.7, 95% CI 1.01–2.8), being 30 years of age or older compared with being less than 30 (30–39 years, prevalence OR 2.08, 95% CI 1.2–3.5; 40 years or older, prevalence OR 2.8, 95% CI 1.6–4.9), sharing needles outside prison (prevalence OR 2.2, 95% CI 1.5–3.3), attending needle-exchange programs (prevalence OR 2.7, 95% CI 1.6–4.5) and having sex with injection drug users (prevalence OR 1.8, 95% CI 1.2–2.8). Injecting drugs while inside prison was also associated with HCV infection (prevalence OR 3.6, 95% CI 1.7–7.5), whereas performing tattoos and piercings on other inmates was a protective factor (prevalence OR 0.4, 95% CI 0.19–0.67). Interaction terms between the participant's sex and all the other independent variables were systematically considered in the model. With all p

values greater than 0.15, none of these terms was retained in the final model.

Interpretation

In this cross-sectional survey of 7 provincial prisons in Quebec, we found that the prevalence of HCV infection was much higher than that of HIV infection (18.5% v. 3.4%). Applying the sex-specific prevalences we found to the 27 184 people (2547 women and 24 637 men) admitted to Quebec's provincial detention centres from April 2005 to March 2006 (Guy Samson, Ministry of Public Security of Quebec: personal communication, 2006), we estimated that there are about 800 HIV-positive (95% CI 500–1150) and 4800 HCV-positive (95% CI 4200–5500) inmates admitted yearly to these prisons, where only sentences of less than 2 years are served.

Injection drug use was by far the most important risk factor for both HIV and HCV infections, with more than 90% of the participants infected by either of these viruses reporting this behaviour before their imprisonment. Among the participants who reported injection drug use, we found that needle-sharing, persistence of injection drug use while incarcerated, participation in a needle-exchange program and having sex with injection drug users were factors independently associated with HCV infection. However, the latter 2 associations are not likely to be causal. Indeed, it has been shown that needle-exchange programs attract injection drug users with higher levels of risky behaviour,^{20,21} whereas sexual activity with injection drug users might be a proxy measure of other undetermined risk factors, since the sexual transmission of HCV is inefficient.^{22–24}

Table 1: Risk behaviours for HIV and hepatitis C virus (HCV) infections among 1357 male and 250 female inmates in 7 Quebec provincial prisons

Behaviour	Outside prison			Inside prison		
	Men, no. (%)	Women, no. (%)	<i>p</i> value	Men, no. (%)	Women, no. (%)	<i>p</i> value
Injection drug use	377 (27.8)	107 (42.8)	< 0.001†	60 (4.4)	2 (0.8)	0.006†
Needle sharing*	201 (53.3)	60 (56.1)	0.42	38 (63.3)	1 (50.0)	0.65
Tattooing, receipt of	657 (48.4)	151 (60.4)	< 0.001†	514 (37.9)	12 (4.8)	< 0.001†
With non-sterile equipment*	102 (15.5)	47 (31.1)	< 0.001†	94 (18.3)	5 (41.7)	0.12
Piercing, receipt of	416 (30.7)	136 (54.4)	< 0.001†	29 (2.1)	10 (4.0)	0.07
With non-sterile equipment*	60 (14.4)	13 (9.6)	0.39	6 (20.7)	3 (30.0)	0.80
Sex with injection drug user	353 (26.0)	112 (44.8)	< 0.001†	NA	NA	–
Unprotected*	272 (77.1)	93 (83.0)	0.16	NA	NA	–
Anal sex	577 (42.5)	126 (50.4)	0.020†	20 (1.5)	NA	–
Unprotected*	478 (82.8)	106 (84.1)	0.57	16 (80.0)	NA	–
Oral sex for money or drugs	106 (7.8)	117 (46.8)	< 0.001†	NA	NA	–
Unprotected*	85 (80.2)	81 (69.2)	0.008†	NA	NA	–
Anal or vaginal sex for money or drugs	82 (6.0)	105 (42.0)	< 0.001†	17 (1.3)	1 (0.4)	0.24
Unprotected*	51 (62.2)	44 (41.9)	0.002†	16 (94.1)	1 (100.0)	0.80

Note: NA = not asked.

*Among subjects who reported the behaviour on the previous line.

†Statistically significant difference between men and women.

The prevalence of HIV infection we found was similar to that reported in previous studies in prison populations in Montréal^{4,25} and Québec City,⁵ with no upward or downward shifts. Furthermore, our results are consistent with those obtained in Canadian,^{8,11,13,25-28} American^{12,29} and European prisons.^{9,30,31} However, this is the first time that the activity of performing tattooing or piercing on other inmates was identified as a protective factor. This result may reflect the adoption of harm-reduction behaviour by tattoo artists for themselves and for those they tattoo.

Different limitations to this study must be considered. First, the prisons were not chosen randomly, which could lead to a selection bias. This bias was, however, minimized by the broad geographic diversity of the prisons selected. Second, recall and social desirability biases related to self-reported behaviour are also possible. These biases were reduced because the questionnaire was self-administered and anonymous. Finally, causal inference in the analysis of risk factors for HCV infection is limited by the cross-sectional design of the study.

In conclusion, we found a high HIV and HCV prevalence among inmates, representing a large number of people infected by either HIV or HCV (> 5000) transiting yearly through Quebec's provincial prisons where the population turnover is high.

In conclusion, we found a high prevalence of HIV and HCV infections among inmates, which represents a large number of people infected by either HIV or HCV (> 5000) transiting yearly through Quebec's provincial prisons, where the population turnover is high. Furthermore, a relatively large proportion of HIV- or HCV-positive inmates are unaware of their infection. Consequently, we believe that HIV and HCV antibody testing and counselling should be offered to all inmates entering prison. In addition, prevention programs, which include ongoing education and harm-reduction measures in prisons, are warranted. Given the high rate of recidivism and short duration of stay in provincial prisons, coordination between correctional facilities and programs in the community may benefit the community at large.

Table 2: Prevalence of HIV infection and hepatitis C virus (HCV) infection among 1607 inmates in select Quebec provincial prisons, by sex and self-reported status of injection drug use

Injection drug use	Prevalence (95% confidence interval), %	
	HIV infection	HCV infection
Men (n = 1357)	2.4 (1.6-3.3)	16.6 (14.6-18.7)
Yes (n = 377)	7.2 (4.8-10.3)	53.3 (41.1-58.5)
No (n = 980)	0.5 (0.2-1.2)	2.6 (1.7-3.7)
Women (n = 250)	8.8 (5.6-13.0)	29.2 (23.6-35.3)
Yes (n = 107)	20.6 (13.4-29.5)	63.6 (53.7-72.6)
No (n = 143)	0.0 (0.0-2.1)	3.5 (1.6-8.0)
All participants (n = 1607)	3.4 (2.5-4.4)	18.5 (16.7-20.5)
Yes (n = 484)	10.2 (7.6-13.2)	55.6 (51.0-60.1)
No (n = 1123)	0.5 (0.1-1.0)	2.7 (1.8-3.8)

This article has been peer reviewed.

Competing interests: None declared.

Contributors: Céline Poulin participated in the design of the study and was responsible for writing the manuscript. Michel Alary was responsible for the design of the study and the data analysis and interpretation. Gilles Lambert and Gaston Godin participated in the design of the study and contributed to the interpretation of the results. Suzanne Landry and Hélène Gagnon were responsible for coordinating the data collection and contributed to the interpretation of the results. Éric Demers performed the statistical analysis. Elena Morarescu was involved in the data interpretation and wrote an early draft of the paper. Jean Rochefort and Christiane Claessens were responsible for the design of the laboratory aspects of the study and carried out the laboratory testing. All of the authors participated in revising the manuscript critically for important intellectual content and approved the final version of the paper.

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