Prevalence of HIV and hepatitis C virus infections among inmates of Ontario remand facilities

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Abstract

Background: Each year more than 56 000 adult and young offenders are admitted to Ontario's remand facilities (jails, detention centres and youth centres). The prevalence of HIV infection in Ontario remand facilities was last measured over a decade ago, and no research on the prevalence of hepatitis C virus (HCV) infection has been conducted in such facilities. We sought to determine the prevalence of HIV infection, HCV infection and HIV–HCV coinfection among inmates in Ontario's remand facilities.

Methods: A voluntary and anonymous cross-sectional prevalence study of HIV and HCV infections was conducted among people admitted to 13 selected remand facilities across Ontario between Feb. 1, 2003, and June 20, 2004. Data collection included a saliva specimen for HIV and HCV antibody screening and an interviewer-administered survey. Prevalence rates and 95% confidence intervals were calculated and examined according to demographic characteristics, region of incarceration and self-reported history of injection drug use.

Results: In total, 1877 participants provided both a saliva specimen and survey information. Among the adult participants, the prevalence of HIV infection was 2.1% among men and 1.8% among women. Adult offenders most likely to have HIV infection were older offenders (≥ 30 years) and injection drug users. The prevalence of HCV infection was 15.9% among men, 30.2% among women and 54.7% among injection drug users. Adult offenders most likely to have HCV infection were women, older offenders (≥ 30 years) and injection drug users. The prevalence of HCV–HIV coinfection was 1.2% among men and 1.5% among women. It was highest among older inmates and injection drug users. Among the young offenders, none was HIV positive and 1 (0.4%) was HCV positive. On the basis of the study results, we estimated that 1079 HIV-positive adults and 9208 HCV-positive adults were admitted to remand facilities in Ontario from Apr. 1, 2003, to Mar. 31, 2004.

Interpretation: Adult offenders entering Ontario remand facilities have a considerably higher prevalence of HIV and HCV infections than the general population.

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In Canada, the prevalence of HIV and hepatitis C (HCV) infections in the general population is estimated to be 0.8% and 0.18% respectively.[1,2] Studies conducted in Canadian penitentiaries have shown that the rates are alarmingly high in inmate populations.[3–7] The elevated prevalence of HIV and HCV infections among inmates has been closely linked to injection drug use and the sharing of injection equipment. Reports have shown that 30%–50% of Canadian inmates have a history of injection drug use.[3,8–10]

Each year more than 56 000 adult and young offenders in Ontario are admitted to remand facilities (jails, detention centres and youth centres), where they await the outcome of legal proceedings, serve short-term sentences (< 60 days) or await transfer to provincial correctional centres or federal facilities. Ontario remand facilities contain the largest number of inmates in Canada. From Apr. 1, 2003, to Mar. 31, 2004, a total of 52 876 adults and 3840 young offenders were remanded to custody in the province (Statistics Branch, Ontario Ministry of Community Safety and Correctional Services: unpublished data, 2005).

Remand facilities, which act as an entry point into the entire correctional system, represent an important offender population for public health concern regarding transmissible infections. They house an inmate population that not only is larger than the inmate population in federal penitentiaries and provincial correctional facilities, but also has a more rapid turnover and shorter stays. In the 2003/04 fiscal year in Ontario, the mean length of stay in a remand facility was 32.2 days, with 50% of stays lasting 9 days or less and nearly 25% of offenders having been admitted more than once during the year.[11] Therefore, there is considerable movement between this population and the general population. Furthermore, many remanded inmates are awaiting transfer to provincial correctional facilities or penitentiaries, or have stays in more than one remand facility, which leads to movement within the correctional system itself and increases the opportunities for HIV and HCV transmission should risk behaviours occur.

The only study of HIV infection among inmates in Ontario's remand facilities was completed in 1993, over a decade

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ago. It showed that 1.0% of adult men, 1.2% of adult women and 0% of young offenders were HIV positive.[12,13] No research has been conducted on the prevalence of HCV infection among offenders in Ontario remand facilities. Given the lack of data regarding the comparability between remand and federal penitentiary inmate populations, the HCV prevalence rates reported in research studies conducted in federal penitentiaries in Ontario or other provinces cannot be directly extrapolated to the Ontario remand population.

We sought to determine the prevalence of HIV and HCV infections among offenders admitted to Ontario remand facilities in 2003 and 2004 and to examine rates by demographic characteristics, region of incarceration and history of injection drug use.

Methods

Study design

The Ontario Remand Study was a voluntary, anonymous, cross-sectional study involving adult and young offenders admitted to selected remand facilities across Ontario between Feb. 1, 2003, and June 20, 2004. The study received ethical approval from the University of Toronto's Human Subjects Review Committee and was approved by the Ministry of Community Safety and Correctional Services' Research Committee.

We used a one-stage cluster sampling method. Participants were recruited from 13 of the 28 existing remand facilities. The 13 facilities were purposively selected to ensure adequate representation of adults and youth, males and females, and geographic regions (northern, western, eastern and central [includes Metropolitan Toronto]). Within each region, institutions with the highest weekly admission rates were selected to reduce the time and cost of data collection. During the study period, the facilities selected for recruitment contained 49% of the total number of admissions. Target recruitment quotas were established for each data collection site, and the length of the data collection period was determined by the time it took to reach the quota.

Study population

All individuals admitted to one of the selected remand facilities between Feb. 1, 2003, and June 20, 2004, and who had not previously participated in the study were eligible.

Compared with the overall remand inmate population, the study sample included an overrepresentation of several subgroups. Females and young offenders (individuals charged under the Youth Criminal Justice Act [or the former Young Offender Act] and typically under the age of 18 years) were intentionally oversampled to ensure precision in calculations of disease prevalence. Aboriginal inmates were also overrepresented compared with the overall remand inmate population (14.1% v. 7.5%) (Statistics Branch, Ontario Ministry of Community Safety and Correctional Services: unpublished data, 2005).

Data collection

Experienced and specially trained data collectors obtained saliva specimens and conducted interviews in a private area. To maintain the anonymity of the participants, verbal informed consent was obtained. To improve the acceptability of the study procedures for the inmates and address safety concerns associated with syringes, saliva specimens were collected instead of serologic samples. Because HIV and HCV antibody testing based on saliva samples is not sufficiently accurate for diagnostic purposes and is not approved for diagnostic testing, and because of the desire to maintain the anonymous nature of the data collection, infected participants could not be informed of their results. However, all participants were informed of the availability of voluntary, nominal HIV and HCV antibody testing through the remand facility's health services and were provided with a list of local anonymous testing locations in the area that could be accessed upon release from the remand facility.

The data collectors obtained saliva samples using the Saliva Sampler (StatSure Diagnostic Systems Inc., Framingham, Mass.) and assigned non-identifying codes to the samples. In the interview, which lasted about 10–15 minutes, the participants were asked about their demographic characteristics, incarceration history, medical information, and HIV- and HCV-related risk behaviours. Each completed interview was given a code that matched the saliva specimen code.

HIV and HCV antibody testing was conducted at the Central Public Health Laboratory of the Ontario Ministry of Health and Long-Term Care. HIV antibody screening was conducted with the use of the DETECT HIV version 1 test kit (Adaltis Inc., Montréal), an enzyme-linked immunoassay (ELISA). Positive results were confirmed with the use of the Vironostika HIV-1 Microelisa System (bioMérieux, Durham, NC). The assay was sensitive (98.7%) and highly specific (100%). For the HCV testing, a modified version of procedures described by Van Doornum and colleagues[14] was used. HCV antibody screening was conducted with the use of the Ortho HCV 3.0 SAVe ELISA test kit (Ortho Diagnostics, Amersham, UK). The hepatitis confirmatory testing was performed with the Bio-Rad MONOLISA anti-HCV Plus version 2 assay (Bio-Rad Laboratories Inc., Montréal). The estimated sensitivity of the assay ranged from 72% to 88%, and the specificity from 89% to 100%.[14]

Statistical analysis

To account for the purposive recruitment process and to ensure that the results were representative of the entire adult remand population in Ontario, the prevalence rates were weighted by region of incarceration, sex and Aboriginal status. To calculate the HIV and HCV prevalence rates (expressed as percentages), we divided the weighted number of confirmed positive test results by the weighted number of valid screening results (excluding inconclusive test results). We calculated 95% confidence intervals (CIs) using binomial approximation or exact methods, as appropriate. Prevalence rates were examined by demographic characteristics (sex, age group and Aboriginal status), self-reported history of injection drug use and region of incarceration.

HCV prevalence rates were adjusted to account for the sensitivity and specificity of the saliva screening assay.[15] This adjustment was not required for the HIV prevalence rates be-

cause of the high sensitivity and specificity of the HIV testing methodology.

The projected number of HIV- and HCV-positive adults admitted to Ontario remand facilities from Apr. 1, 2003, to Mar. 31, 2004, was estimated based on the study results. The estimated number of infected adults was the product of the total number of adult males and females admitted during that period and the weighted prevalence rate observed in the subgroup. Similarly, we estimated the upper and lower limits of the number of infected inmates on the basis of the weighted 95% CIs.

Results

During the study period, 2303 adult and young offenders were admitted to the 13 remand facilities included in the study. Sixty-four (2.8%) were deemed ineligible to participate (they were unable to provide informed consent because of low intellectual functioning, they were intoxicated or medicated, or they had language barriers), 66 (2.9%) were missed by the data collector, and 231 (10.0%) refused to participate. Thus, the overall participation rate was 84.3% (1942/2303). Refusals were highest among Aboriginal inmates ($p = 0.01$) and among inmates in the northern region ($p < 0.001$). The main reasons given for refusal included not being interested in the study (53%), not being able to receive their HIV and HCV test results (7%) and privacy concerns regarding potential DNA collection (6%).

Participation rates were highest among non-Aboriginal inmates ($p = 0.01$) and among inmates in the eastern, central and western regions ($p < 0.001$). Of the 1942 participants, 1877 (96.7%) provided a saliva specimen and completed the survey (Table 1). A history of injection drug use was reported by 30.3% (477/1576) of the adults and 4.7% (14/299) of the young offenders who participated.

Twenty-five adults tested positive for HIV antibodies on saliva screening. The weighted prevalence rate was 2.0% (31.1/1528, 95% CI 1.3%–2.8%). Table 2 shows the HIV prevalence rates by demographic characteristics, region of incarceration and history of injection drug use. The prevalence of HIV infection was highest among adult offenders, those aged ≥ 30 years and those who reported a history of injection drug use.

In total, 284 adults tested positive for HCV antibodies on saliva screening. The weighted prevalence rate was 17.6% (262.4/1490, 95%CI 17.1%–21.1%). Although there were similarities between the HIV and HCV prevalence patterns (prevalence highest among adults, inmates 30 years of age or older and inmates who reported a history of injection drug use), the prevalence of HCV infection, unlike that of HIV infection, was higher among female offenders than among male offenders (Table 2).

After adjustment to account for the sensitivity and specificity of the HCV saliva screening assay, the adjusted prevalence rates for HCV infection among the adult participants ranged from 10.8% to 20.0%.

Seventeen adults had coinfection with HIV and HCV. The weighted prevalence rate of coinfection was 1.2% (18.0/1453, 95% CI 0.7%–1.8%). The prevalence of coinfection was highest among participants 30 years of age or older and those who reported a history of injection drug use (Table 2).

Of the 299 young offenders who participated in the study, none tested positive for HIV antibodies (0%, 0/298, 95% CI 0.0%–1.0%) and 1 tested positive for HCV antibodies (0.4%, 1/286, 95% CI 0.01%–2.0%). The adjusted HCV prevalence rates ranged from 0% to 0.4%.

On the basis of the study results, we estimated that 1079 HIV-positive adults (range 643–1618) and 9208 HCV-positive adults (range 7902–10 521) were admitted to Ontario remand facilities from Apr. 1, 2003, to Mar. 31, 2004.

Table 1: Characteristics of 1877 adult and young offenders in select Ontario remand facilities* who provided saliva samples for HIV and hepatitis C virus antibody testing and who completed the study questionnaire

Characteristic	No. (%) of participants	
	Adult offenders *n = 1578*	Young offenders† *n = 299*
Sex	*n = 1578*	*n = 299*
Male	1270 (80.5)	277 (92.6)
Female	308 (19.5)	22 (7.4)
Ethnic group	*n = 1573*	*n = 298*
White	1013 (64.4)	142 (47.7)
Aboriginal	221 (14.0)	18 (6.0)
Black	140 (8.9)	57 (19.1)
Other	199 (12.7)	81 (27.2)
Place of birth	*n = 1576*	*n = 299*
Canada	1297 (82.3)	224 (74.9)
Elsewhere	279 (17.7)	75 (25.1)
Prior incarceration	*n = 1578*	*n = 298*
Yes	1318 (83.5)	225 (75.5)
No	260 (16.5)	73 (24.5)
History of injection drug use	*n = 1576*	*n = 299*
Yes	477 (30.3)	14 (4.7)
No	1099 (69.7)	285 (95.3)
History of unprotected sex	*n = 1543*	*n = 293*
Yes	1461 (94.7)	229 (78.2)
No	82 (5.3)	64 (21.8)
History of sex with same-sex partner		
Males	*n = 1259*	*n = 276*
Yes	33 (2.6)	0
No	1226 (97.4)	276 (100.0)
Females	*n = 304*	*n = 22*
Yes	90 (29.6)	4 (18.2)
No	214 (70.4)	18 (81.8)

*Jails, detention centres and youth centres to which people are remanded to await trial, to serve short-term sentences (< 60 days) or to await transfer to correctional facilities.
†Among young offenders the mean age was 17.6 (range 16–20) years.

Interpretation

We found that adult offenders admitted to Ontario remand facilities had a considerably higher prevalence of HIV and HCV infection, with HIV rates 11 times higher and HCV rates 22 times higher than those in the general population. Rates were highest among those who were older (≥ 30 years) and those who reported a history of injection drug use. The observed prevalence rates are comparable to those reported in other Canadian studies.[3–9,12,13,16,17]

Remand facilities, which act as an entry point into the entire correctional system, represent an important offender population for public health concern regarding transmissible infections. They house an inmate population larger than that in federal penitentiaries and provincial correctional facilities, but one that has a rapid turnover and short stays. Therefore, there is considerable movement between this population and the general population. Furthermore, there is movement within the correctional system because many remanded inmates are awaiting transfer to provincial correctional facilities or penitentiaries, or have stays in more than one remand facility. Such movement increases the risk of HIV and HCV transmission should risk behaviours occur.

Since 1993, HIV prevalence rates in Ontario remand facilities have increased significantly among adult males, but they have remained fairly stable among adult females.[12,13] In 1993 the prevalence among adult males was 1.0% (95% CI 0.8%–1.2%), and in 2003/04 it was 2.1% (95% CI 1.3%–2.8%). Among adult females, the rates were 1.2% (95% CI 0.6%–1.8%) and 1.8% (95% CI 0.4%–5.0%) respectively. Similar to the 1993 study results, the rates of HIV infection were highest among older inmates (≥ 30 years) and those reporting a history of injection drug use.

HIV and HCV infections may pose a significant burden to health care services and a serious transmission threat. On the basis of our results, we estimated that 1079 HIV-positive adults (range 643–1618) and 9208 HCV-positive adults (range 7902–10 521) were admitted to Ontario remand facilities from Apr. 1, 2003, to Mar. 31, 2004.

We found that the prevalence of HCV infection was higher among adult female offenders than among adult male offenders. Previous research has consistently reported higher rates among female inmates in penitentiaries, which suggests that female inmates are more likely than male

Table 2: Weighted prevalence of HIV infection, hepatitis C virus (HCV) infection and HIV-HCV coinfection among adult and young offenders, by demographic characteristics, region of incarceration and history of injection drug use

	Weighted prevalence* (95% confidence interval), %		
Variable	HIV infection	HCV infection	HIV-HCV coinfection
Adult offenders	2.0 (1.3-2.8)	17.6 (17.1-21.1)	1.2 (0.7-1.8)
Sex			
Male	2.1 (1.3-2.8)	15.9 (14.0-17.9)	1.2 (0.6-1.8)
Female	1.8 (0.4-5.0)	30.2 (23.5-37.0)	1.5 (0.3-4.8)
Region of incarceration in Ontario			
Northern	0.3 (0.0003-2.4)	15.1 (10.0-20.2)	0.3 (0.0003-2.6)
Eastern	2.7 (0.9-4.6)	25.1 (20.1-30.0)	2.2 (0.5-3.9)
Central	2.9 (1.6-4.2)	16.5 (13.6-19.4)	1.2 (0.4-2.1)
Western	1.0 (0.3-2.5)	15.0 (11.5-18.6)	1.0 (0.3-2.7)
Age group, yr			
18-29	0.2 (0.01-0.9)	4.7 (3.1-6.3)	0.1 (0.0001-0.8)
30-39	2.7 (1.2-4.2)	21.8 (17.9-25.8)	1.1 (0.3-2.6)
40-49	3.0 (1.2-4.9)	36.2 (30.9-41.6)	2.9 (1.0-4.8)
≥ 50	8.8 (3.1-14.4)	26.4 (17.5-35.4)	4.6 (1.3-11.6)
Injection drug use			
Yes	5.7 (3.5-7.9)	54.7 (49.8-59.6)	4.4 (2.4-6.4)
No	0.7 (0.2-1.1)	4.1 (2.9-5.2)	0.1 (0.0-0.5)
Aboriginal status			
Aboriginal	0.0 (0.0-2.5)	16.6 (9.8-23.4)	0.0 (0.0-2.6)
Non-Aboriginal	2.2 (1.4-3.0)	17.7 (15.7-19.7)	1.3 (0.7-2.0)
Young offenders	0.0 (0.0-1.0)	0.4 (0.01-2.0)	0.0 (0.0-1.0)

*Weighted by sex, Aboriginal status and region of incarceration (not for young offenders).

inmates to have a history of injection drug use and are at greater risk of HIV and HCV infection based on needle-sharing behaviours.[18]

The relation between HIV and HCV infection and age has been shown in previous research and represents the increased risk of infection with increased length of exposure associated with risk behaviour (i.e., injection drug use).[19] In Ontario, between 1985 and 2003, two-thirds of people found to be HIV positive were aged 25–44 years (mean age at diagnosis 34.3 years).[20]

The prevalence of HIV and HCV infection among young offenders in our study was low or nonexistent (0% and 0.4% respectively). In 1993, the observed prevalence of HIV among young offenders was also 0%.[12,13] Despite the low levels of current infection, reported high levels of injection drug use and other risk behaviours indicate the need for education and prevention messages targeted at this population.

Given the general consistency regarding HIV and HCV prevalence rates between provinces across Canada reported in previous studies,[3–9,12,13,16,17] the findings in our study may indicate high rates of HIV and HCV infections among offender populations in other provinces. Our results may be rationale for further study to gauge the scope of the problem in offender populations across Canada.

Our study had limitations. The study design allowed for the determination of prevalent, rather than incident, cases of HIV and HCV. Analysis of prevalent cases does not allow for the inference of a causal relation between a characteristic and infection. Second, the self-report of risk behaviours, especially those of a sensitive or illegal nature, may lead to the underreporting of risk behaviours within the correctional setting. Finally, the use of saliva specimens instead of blood samples for HCV antibody screening may lead to outcome misclassification. However, we adjusted the HCV prevalence rate to account for the sensitivity and specificity of the assay.

In conclusion, HIV and HCV infections are significant health issues that face inmate populations. Given the considerable movement between the remand inmate population and the general population, as well as the movement of inmates between facilities within the correctional system, there are opportunities for HIV and HCV transmission should risk behaviours occur. Because of this risk of transmission during incarceration and after release, relevant and targeted education and prevention efforts are important. Incarceration may provide an important opportunity for HIV and HCV antibody testing, education, prevention, care and treatment in a high-risk population.

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