

HIV, hepatitis C and risk behaviour in a Canadian medium-security federal penitentiary

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Summary

In a voluntary anonymous HIV and hepatitis C serology screen in a Canadian male medium security federal penitentiary, 68% of 520 prisoners volunteered a blood sample and 99% of those giving a blood sample completed a risk behaviour questionnaire which was linked numerically to the blood sample. Compared to previous screenings for HIV (4 years earlier), and hepatitis C (3 years earlier) in the same institution, HIV seroprevalence had risen from 1% to 2% and hepatitis C seroprevalence from 28% to 33%. The overwhelming risk association for hepatitis C was with drug use

outside prison, although there was a small group of men who had only ever injected drugs inside prison, over half of whom had been infected with hepatitis C. The proportion of prisoners who had injected drugs in prison rose from 12% in 1995 to 24% in 1998. The proportion of surveyed individuals sharing injection equipment at some time in prison was 19%, and while HIV rates in the prison are currently low, HIV prevalence amongst Canadian street i.v. drug users is rising rapidly, underlining the need for urgent preventative measures in prisons.

Introduction

Over the last few years it has been recognized that the prevalence of HIV infection is much higher in prisoners in Western countries than in the communities from which they come.^{1,2} More recently, it has also been recognized that the prevalence of hepatitis C in prisons is also much higher in comparison to the general population,³⁻⁶ and is related to the high number of drug users among the incarcerated. These individuals not only bring to prison diseases such as HIV and hepatitis which they have acquired on the street, but are likely to continue the risk behaviour such as sharing of injection equipment which got them infected in the first place.^{7,8} Indeed, the unavailability of clean injection equipment in prisons in most Western countries results in small numbers of needles and syringes being shared by many individuals, and increases the chances that those not already infected will eventually become so.⁹⁻¹¹

In 1995,⁶ we reported the results of a voluntary, anonymous seroprevalence survey of hepatitis C serology in a male medium-security Canadian federal penitentiary (prisoners sent to federal penitentiaries have all been sentenced to two or more years in prison). We had conducted a survey of HIV serology in the same prison the previous year.¹² Of the total of 592 prisoners, 408 volunteered a blood sample and of these 27% tested positive for hepatitis C and 1% positive for HIV. At the time of the hepatitis C study, we had administered a simple questionnaire regarding risk behaviour which was unlinked to the blood samples, and 12% of inmates admitted to injecting drugs in prison at some time although not necessarily during their current sentence.

This paper reports a repeat survey of hepatitis C and HIV serology carried out in 1998 in the same

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penitentiary. On this occasion a risk behaviour questionnaire was linked to the blood sample and included questions on drug use, injection practices and tattooing.

Methods

Ethical approval for the study was obtained from the Queen's University Faculty of Medicine Ethics Review Board.

The study format, with the exception of the questionnaire was essentially the same as for our previous prison studies.^{5,6,12} The nature of the study and the methodology was discussed with the prison inmate committee and the Lifers Group (a group representing prisoners serving life sentences) and an acceptable format was agreed upon both for the conduct of the study and the nature of the questionnaire. An educational programme around hepatitis C and HIV and the reasons for the study were offered on a voluntary basis to the whole prison population in a group format.

A video which had been made for the previous studies by a prisoner film group (Big House Productions) was updated and shown several times on the in-house prison television circuit.

A one-page questionnaire (Appendix 1) included detailed questions on drug use both before and during incarceration as well as asking about injection practices and tattooing. There were no questions about sexual practices as discussions with prisoner representatives indicated such questions would be unpopular and might result in refusal to complete the questionnaire. At the request of prisoner representatives, a question was included on in-prison dental treatment. Prisoners were also asked how long they had been in prison serving their current sentence.

Blood samples were collected in a single tube and labelled with a number unique to the individual. The same number was applied to the questionnaire which the prisoner had completed at the time of donating blood. A third label with the same number was given to the prisoner to present in order to obtain his results.

Each prisoner's test results were placed in a sealed envelope with his number on the outside and envelopes were handed out in exchange for the appropriately numbered sticker by members of the study team who were available at the time and subsequently for post-test counselling.

The study was carried out over 2 days in March 1998. Sections of the prison were shut down sequentially, and two four-person teams went around the ranges collecting blood from volunteers, each of whom was offered a questionnaire to complete. It

was made clear to prisoners that the whole process was voluntary and that individuals donating a blood sample were not obliged to complete the questionnaire.

Results were distributed to participants 4 weeks later, and the population was given the overall results.

Blood samples were sent to the Public Health Laboratory at Kingston for testing. Seropositivity was established by detection of antibodies to hepatitis C (anti-HCV) and to HIV in serum. Initial screening was carried out using the micro-particle enzyme immunoassay (MEIA), the Abbott AXSYM System: HCV version 3 for anti HCV, and HIV-1/HIV-2 for HIV antibody detection. Samples positive on the initial screen were repeated and confirmed by immunoblotting using the LIATEK III (Organon Teknika) and NOVA-PATH- BIORAD-HIV 1 (Bio-Rad Laboratories) for hepatitis C and HIV, respectively. Samples with 'indeterminate' results were further tested using a third-generation HCV 3.0 Sanofi or Biochem Immunosystems Detect HIV version 1 ELISA.

Univariate analysis was used to determine the association between reported risk factors and hepatitis C status. χ^2 tests were used to determine the statistical significance of the association, and odds ratios were generated to estimate the magnitude of the association. Logistic regression was used to control for confounding.

Results

Of the 520 prisoners, 355 (68%) volunteered a blood sample (similar to the 69% who had volunteered for the 1995 hepatitis C study in the same prison⁶); only 5 of those 355 did not complete a questionnaire. Not all prisoners answered all of the questions (see Appendix 1).

Forty-four percent of prisoners had served less than 2 years of their current sentence, 20% had served between 2 and 4 years and 37% had been in for more than 4 years, with 6% having been in for over 15 years.

One hundred and seventeen (33%) tested positive for hepatitis C and six (2%) tested positive for HIV: this compares to 28% who tested positive in the 1995 study in the same prison⁶ and 1% who tested positive for HIV in 1994.

Logistic regression was done using hepatitis C status as the dependant variable. After accounting for potential confounding, the only variable still independently related to being hepatitis-C-positive was injecting drugs outside the prison ($p=0.0056$).

Risk behaviours: 95/350 (27%) reported no risk behaviour and of these only 6% were hepatitis-C-

Table 1 Results for hepatitis C testing in individuals with tattoos who denied any history of i.v. drug use

	Number of responders	Hepatitis C positive (%)
Tattooed inside/outside prison or both	124 (35%)	11
Tattooed outside only	38 (11%)	16
Tattooed inside only	39 (11%)	5

The majority of those who had been tattooed inside only had been tattooed during their current sentence.

Table 2 Results for hepatitis C testing in those reporting i.v. drug use

	Number of responders	Hepatitis C positive (%)
Ever injected drugs	131/350 (37%)	73
IV drug use inside and outside prison	64/350 (18%)	85
Outside only	46/350 (13%)	63
Inside only	21/350 (6%)	52

A total of 24% of prisoners had injected in prison at some time (not necessarily during the current sentence): this compares to 12% who gave the same response in the 1995 study.⁶

Table 3 Results for those reporting the sharing of injection equipment

	Number of responders	Hepatitis C positive (%)
Shared inside and outside prison	40/350 (11%)	90
Outside but not inside	23/350 (7%)	78
Inside but not outside	27/350 (8%)	67*

*Does not include three prisoners who appeared to be in the process of seroconversion.

Table 4 Number of prisoners reporting injecting a specific drug and the hepatitis C positivity associated with each drug (there is overlap between groups, as some prisoners reported injecting more than one type of drug)

	Number injecting	Hepatitis C positive (%)
Heroin	76/88 (86%)	78
Cocaine	23/88 (26%)	87
Speed	12/86 (14%)	83

positive and none were HIV-positive. Table 1 shows the results of hepatitis C testing in prisoners who had been tattooed and denied any history of i.v. drug use. Table 2 shows hepatitis C testing results in prisoners who reported a history of i.v. drug use either inside or outside prison or both.

Five of the six prisoners who tested positive for HIV had a history of intravenous drug use. One prisoner, with a history of in-prison i.v. drug use, who had tested positive for hepatitis C but negative for HIV in the study developed a 'flu'-like illness 6 weeks after the study and was found subsequently to be HIV-positive.

Drug injectors were asked about bleach use, and there was no significant difference in hepatitis C infection between those who cleaned injection equipment regularly with bleach and those who did not. There was no correlation between hepatitis C infection and visiting the dentist. There was also no correlation, negative or positive between length of sentence served and hepatitis C positivity.

Discussion

This is the second hepatitis C seroprevalence study conducted in this prison in less than 4 years. The conduct of this study was very similar to the first one,⁶ with the exception that in this study prisoners were asked to complete a one-page questionnaire which was linked to the blood sample. This questionnaire asked about risk behaviour relating to drug use and tattooing but did not explore sexual risks. In 1995 a much simpler questionnaire had been offered which was not linked to the blood sample. The results of the latest study show an increase in the prevalence of hepatitis C infection from 27% to 33%. HIV seroprevalence has also increased from 1% to 2%.

The linked questionnaire results show a strong association between intravenous drug use both inside and outside the prison and hepatitis C infection. The strongest association is with those who have injected outside prison, but there are a number of individuals who appear to have contracted their hepatitis C as a result of starting to inject for the first time in prison. An increased prevalence of hepatitis C is found in individuals who share injection equipment both in and outside prison. Although there is an increase in hepatitis C positivity in those who are tattooed over those with no apparent risk behaviour, this is not statistically significant.

The number of individuals who had ever injected drugs in prison increased from 12% in 1995 to 24% in this study. It would appear from this study that much of the increase in numbers injecting in prison is due to increasing numbers of IV drug users being

incarcerated and bringing their habit in with them. Furthermore, those who shared injection equipment on the outside were likely to continue to do so in prison and another 27 had started sharing for the first time in prison. There was no apparent protective effect of regular bleach use against hepatitis C infection in the drug users.

Tattooing does not emerge as an independent variable. The rate in those only tattooed in prison, where it is an illegal practice performed clandestinely and often with unsterile needles, is surprisingly low at 5%, although the number is small (only 39 prisoners). This latter figure is of interest because an educational film about the health risks of tattooing had been made in this prison 2 years previously by an inmate film unit (Big House Productions) and had involved all the known tattoo artists in the prison at that time. Tattooing has been recognized as a risk factor for transmission of hepatitis C inside prison.^{13,14}

The number of HIV positives (six) was too small to draw any useful conclusions, but five of the six had a history of i.v. drug use, and this reflects the predominant transmission risk that we see in the HIV-positive prisoners in the several federal penitentiaries in our region. It is of note that one prisoner who tested negative for HIV in the study developed a 'flu'-like illness 6 weeks later and seroconverted. This man had been in prison for over 4 years and was a current i.v. drug user who had been sharing equipment with an individual known to be HIV-positive. In-prison HIV seroconversions are reported infrequently.¹⁵ This prisoner had been sharing injection equipment with at least 10 other individuals, all of whom subsequently tested negative for HIV.

Hepatitis C and HIV infection rates are high in prisons in the industrialized world and the rates reported here are similar to rates reported elsewhere.^{2,4,11,16,17} These high infection rates seem to be due, in large part, to the high rates of incarceration of intravenous drug users.^{7,8,11,18-21} There has been concern in recent years about the transmission of both hepatitis and HIV within prisons because of the concentration of IV drug users and the lack of facility for safe injection practices.²² It would seem from this study that although much of the hepatitis C is contracted outside the prisons, there are some who appear to have been infected by injecting for the first time in prison and others who appear to have shared for the first time in prison.

The rates of both hepatitis C and HIV are rising amongst street drug users in Canada. A recent study in Vancouver found a seroprevalence for hepatitis C antibody of 85% with an incidence density of 26.7 per hundred person years (D. Patrick, personal communication) and HIV rates are rising in i.v. drug users in Canada²³ although lagging behind the rise in hepatitis C infection levels. Clearly these rising

rates are being imported into the prisons, with the added risk of additional spread within institutions. Reported rates of hepatitis C in i.v. drug users are much higher than rates of HIV, probably reflecting the higher transmission efficiency of hepatitis C.²⁴

It is unlikely that inclusion of questions regarding sexual activity would have altered the results as studies which have included such questions have usually found a low level of sexual activity in prison, probably in part due to a reluctance to divulge such information.²⁵

A number of measures has been proposed to decrease the spread of blood-borne pathogens in prisons. These include provision of bleach and condoms, drug rehabilitation, methadone programmes and provision of clean needles and syringes. Many jurisdictions have adopted at least some of these measures, with some European countries taking the lead in provision of clean needles and syringes.²⁶ It would seem clear from our observations, that at least in Canada, the bulk of the problem is being imported into the prisons from the outside with further transmission occurring within the prisons. Society needs to urgently consider some alternatives to incarceration of i.v. drug users in an environment where drugs are readily available, where drug rehabilitation programmes are poor or non-existent, where methadone is often not available, and where safe injection practices are often impossible. Clearly some offenses require removal of the individual from society, but a recently reported pilot scheme in Britain whereby drug users, many with a history of multiple criminal offences, were directed into drug rehabilitation programmes, offers a constructive alternative for many²⁷ and offers significant monetary savings to society in the form of reduced drug related criminal activity.

HIV is transmitted by i.v. drug use, although less efficiently than hepatitis C. The rising level of hepatitis C on the streets in Canada has been followed by a rising level of HIV. It is only a matter of time before the increased HIV rates appear in the prisons in Canada, as they have already done in some other countries. It is important to recognize that although there are harm reduction strategies which should be used within the prisons, the bulk of the problem is on the streets, and that public policy should be directed at primary prevention and drug rehabilitation programmes, as well as directing non-violent drug-addicted offenders into rehabilitation programmes as an alternative to incarceration.

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Appendix 1: Questions asked of prisoners and corresponding answers to each question

Question	Yes	No	Not applicable	Missing
(1) Have you ever injected drugs outside Prison?	110 (31%)	240 (68%)	–	5 (1%)
(2) Have you injected drugs at any time you have been in Prison?	85 (24%)	265 (75%)	–	5 (1%)
(3) Have you injected drugs while in Joyceville Prison?	75 (21%)	275 (78%)	–	5 (1%)
(4) Have you injected drugs in the last six months?	70 (20%)	280 (79%)	–	5 (1%)
(5) Have you shared injection equipment (works) with anyone outside Prison?	63 (18%)	287 (81%)	–	5 (1%)
(6) Did you share works with anyone while in Prison?	67 (19%)	283 (80%)	–	5 (1%)
(7) Have you shared works with anyone in Joyceville?	61 (17%)	288 (81%)	–	5 (1%)
(8) Have you shared works with anyone in Joyceville in the last six months	54 (15%)	296 (84%)	–	5 (1%)
(9) If you have shared works with anyone in Joyceville in the last six months, how many people do you think were using that set of works?				
one person	7 (2%)			
two people	7 (2%)			
three people	13 (4%)			
four people	1 (<1%)			
five people	5 (1%)			
six people	4 (1%)			
eight people	3 (1%)			
ten people	1 (<1%)			
twelve people	1 (<1%)			
fifteen people	1 (<1%)			
twenty people	1 (<1%)			
thirty people	1 (<1%)			
missing	310 (87%)			
(10) If you have shared works in Joyceville, did you clean the works with bleach before your turn?	61 (17%)	2 (<1%)	283 (80%)	9 (2%)

(11) If you have injected drugs in prison, which drugs have you used?				
(a) cocaine	23 (7%)	65 (18%)	262 (74%)	5 (1%)
(b) heroin	76 (21%)	12 (3%)	262 (74%)	5 (1%)
(c) speed	12 (3%)	74 (21%)	264 (74%)	5 (1%)
(d) other:				
none	4 (1%)			
dilaudid	3 (1%)			
morphine	2 (<1%)			
dilaudid and morphine	5 (1%)			
marijuana	2 (<1%)			
downers	1 (<1%)			
marijuana and hash	1 (<1%)			
acid	1 (<1%)			
not applicable	330 (93%)			
missing	6 (2%)			
(12) Have you ever had a tattoo outside prison?	160 (45%)	188 (53%)	–	7 (2%)
(13) Have you ever had a tattoo in prison?	185 (52%)	165 (46%)	–	5 (1%)
(14) Have you ever had a tattoo in Joyceville?	129 (36%)	220 (62%)	–	6 (2%)
(15) Have you visited the dentist while in Joyceville?	182 (51%)	158 (44.5%)	–	15 (4%)
(16) How long have you been in prison (this sentence only)? (circle one)				
0–1 years	70 (20%)			
1–2 years	80 (23%)			
2–4 years	69 (19%)			
4–6 years	39 (11%)			
6–10 years	41 (12%)			
10–15 years	24 (7%)			
15 + years	22 (6%)			
missing	10 (3%)			

For questions 9, 11d and 16, the frequency of each response and the corresponding percentage of the total are listed in the 'yes' column.