
The prevalence and the risk behaviours associated with the transmission of hepatitis C virus in Australian correctional facilities

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SUMMARY

This study measured the prevalence and the risk factors associated with HCV antibody-positive prisoners. A total of 630 prisoners completed a questionnaire about risk behaviours associated with HCV transmission and were tested for HCV antibody from a blood test. Of these 362 (57.5%) prisoners were HCV antibody positive. A total of 436 (68.8%) prisoners reported ever injecting drugs and 332 reported injecting drugs in prison. HCV-positive prisoners were more likely to have injected drugs (OR 29.9) and to have injected drugs in prison during their current incarceration (OR 3.0). Tattooing was an independent risk factor for being HCV positive (OR 2.7). This is the first study conducted on prisoners that has identified having a tattoo in prison as a risk factor for HCV. Injecting drugs whilst in prison during this incarceration was also a risk factor for HCV. Our results show prisoners who injected drugs outside of prison continue to inject in prison but in a less safe manner.

INTRODUCTION

Hepatitis C virus (HCV) poses a major public health challenge worldwide. The primary health concern is that chronic HCV infection can lead to cirrhosis and hepatocellular carcinoma. The World Health Organisation estimates that over 170 million people are chronically infected with HCV and that there are 3–4 million newly infected persons each year. In Australia it is estimated there are 210 000 people with HCV antibodies (1% of the population), with an estimated 16 000 new infections in 2001. Of all the people who are HCV antibody positive 75% are estimated to have chronic HCV infection [1].

Injecting drug users (IDUs) represent the major risk group for the transmission of HCV. Of public health concern is the ongoing high incidence of HCV infection in this group despite programmes that have proved effective in preventing the spread of blood-borne viruses (BBVs) such as HIV and hepatitis B virus (HBV) [2]. The high prevalence of HCV among IDUs means that even infrequent risk-taking behaviour is sufficient to maintain a high rate of HCV transmission [3].

Prison settings are recognized worldwide as being important sites for transmission of bloodborne viruses such as HIV, HBV and HCV, particularly where there are high prevalences of infection upon entry combined with continued injecting drug use in the prisons [4, 5]. Many studies in Australia and overseas have reported a high prevalence of BBVs amongst prisoners [5–7]. The seroprevalence of HCV in Victorian

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prisons in 1991/1992 was 39% [8] and elsewhere in Australia in 1994 was 36% [9]. The seroprevalence of HCV in prisoners who had injected in prison in that study was over 60% [10]. There are also reports of prisoners becoming infected with BBVs whilst in prison [11, 12]. Other studies have also reported injecting drugs, sharing of needles and injecting equipment, and tattooing occurring in prisons [6, 13–16].

The majority of prisoners in Victoria are incarcerated for less than a year before they return to the general community. To reduce the impact of HCV in the community we need to understand the prevalence and transmission risks of HCV in prisoners and reduce the transmission in this group. This will have both a public-health benefit and a direct benefit to the prisoners. This study estimated the prevalence and risk factors for HCV exposure among inmates in Victorian correctional facilities. It measured risk factors associated with the transmission of HCV both inside and outside the prison including injecting drug use, tattooing and body piercing.

METHODS

The study was a cross-sectional study conducted in five correctional facilities in Victoria between August and November 2001. These facilities were the larger correctional facilities in Victoria. Four men's prisons and one women's prison participated in the study. Port Phillip Prison is the major remand prison for males in Victoria; Fulham Prison is a medium- and minimum-security prison, Loddon Prison is a designated 'drug-free' medium- and minimum-security prison; and Barwon Prison is the maximum-security prison for men. The Dame Phyllis Frost Centre (DPFC) is the main women's prison in Victoria and has remand, minimum-, medium- and maximum-security prisoners.

An advisory committee was established to discuss study methodology, prisoner participation and management of the study results. Correctional facility management, staff and prisoner peers were consulted about the proposal and study methodology in the project's early stages. The recruitment methodology and study questionnaire were adjusted following feedback from these groups.

Participating prisons had a Recruitment Day where the research staff entered the prison and moved from prison unit to unit inviting prisoners to participate in the study; participation was voluntary. The study aimed to recruit 600 prisoners. Participating prisoners

Table 1. Comparison of prisoners in the study with prisoners in the Statistical Profile of The Victorian Prison System 1995/1996 to 1999/2000

Group	Study group (<i>n</i> = 642)	All prisoners – 2000* (<i>n</i> = 3153)
Median age (all prisoners)	30 years	31.7 years
Unsentenced	17%	13.8%
Offence (sentenced)		
Fraud	5.8%	3.5%
Drug possession/dealing	15.7%	10.9%
Property crime/theft†	21.1%	24.1%
Violent crime‡	38.9%	43.5%

* 'All prisoners – 2000' is the statistical profile of all prisoners incarcerated in the Victorian prison system in the year 2000 [18].

† Property/theft – combination of robbery, break and enter, and other theft.

‡ Violent crime – offences against the person, robbery and extortion.

completed a study questionnaire and gave a finger-prick blood sample. The questionnaire was designed to be self-administered but research staff and prisoner peers assisted prisoners who had difficulties with language and/or literacy. After completing the questionnaire a lancet was used to prick the prisoner's finger. Three blood spots were placed on specially marked blotting/filter paper. Victorian Infectious Disease Reference Laboratories (VIDRL) conducted serological testing of specimens for antibodies to HCV using standard testing methods [17].

Ethics approval for the study was gained from the appropriate Ethics Committee. The study results were placed on an Access database. Results were analysed using SPSS and STATA statistical packages. *t* tests and χ^2 tests or Fisher's exact test were used to examine associations between variables. Logistic regression was used to calculate odds ratios (ORs) for the association of HCV antibody positivity with particular risk factors for infection.

RESULTS

A total of 642 prisoners participated in the study from a total of 2210 prisoners at 'lock down' on the study recruitment days. All prisoners who participated in the study completed a study questionnaire and 630 (98%) provided a blood sample. There were 124 female participants. Prisoners who participated in the study were not markedly different from the profile of

Table 2. *Injecting drugs in the community and in prison (n = 634)*

Group	n (%)	95% CI
Ever injected drugs	436 (68.8)	65.0–72.4
Injected drugs in the community only	117 (18.4)	15.5–21.7
Injected drugs in prison only	9 (1.4)	0.7–2.7
Injected drugs in the community in the week before coming into prison	311 (48.4)	44.5–52.4
Injected drugs in the community in the month before coming into prison	337 (52.5)	48.4–56.4
Ever injected drugs in prison	322 (49.7)	45.7–53.6
Proportion of all prisoners who injected drugs this time in prison	223 (34.7)	31.0–38.7
Proportion of 436 IDUs who injected drugs this time in prison	223 (51.1)	46.3–55.9
Injected drugs in the last month in prison	43 (6.7)	4.9–8.9

CI, Confidence interval.

Table 3. *Comparison of injecting practices of prisoners who have injected drugs in the community and in prison this time*

Number of people shared with	Last time injected in the community (%) (n = 215)†	Last time injected in prison (%) (n = 215)†	P value*
>5	4 (1.9)	15 (7.0)	<0.0001
3–5	4 (1.9)	21 (9.8)	
2	25 (11.7)	33 (15.4)	
1	40 (18.7)	28 (13.1)	
0	132 (61.7)	99 (45.8)	
Don't know	7 (4.0)	19 (8.9)	
Use of a brand-new needle	Last month in the community (%)	Last month in prison (%)	P value*
All injections	24 (68.6)	13 (37.1)	<0.0001
Most of the time	7 (20.0)	2 (5.7)	
Half the time	3 (8.6)	1 (2.9)	
Some of the time	0 (0)	3 (8.6)	
Never	1 (2.9)	16 (45.7)	

* Fisher's exact test.

† Although 223 prisoners reported injecting drugs 'this time' in prison, data comparing injecting in prison to injecting in the community was only available for 215 individuals.

all prisoners in Victorian correctional facilities in 2000 [18]. There were minor differences for the prisoners' age, the number of prisoners on remand and the crime leading to the prisoners' incarceration (Table 1).

There were 362 prisoners (57.5%) who were HCV antibody positive (55% males, 67% females). A total of 436 prisoners (68.8%) reported ever injecting drugs; 337 of these IDU prisoners were HCV antibody positive. Of the 436 ever-injecting-drugs prisoners, 311 had injected drugs during the week before

entering prison and 337 had injected drugs during the month before entering prison. Of the 436 prisoners who had ever injected drugs, 322 reported injecting drugs whilst in prison, 223 had injected drugs this time in prison and 43 had injected drugs during the last month in prison (Table 2).

Prisoners who injected drugs in prison did so in a less safe manner compared to when they injected drugs in the community. They were more likely to share a needle and syringe when inside prison, and less likely to use a brand-new needle and syringe (Table 3).

Table 4. *The association between HCV and sharing injecting equipment among prisoners who injected drugs in prison this time (unadjusted odds ratios)*

Variable	OR	95% CI
No. of people with who shared a needle and syringe		
0	1.0	
1–2	1.0	0.4–2.6
3+	2.6	0.5–12.1
Shared a spoon		
No	1.0	
Yes	3.0	1.2–7.8
Shared water		
No	1.0	
Yes	2.0	0.8–5.3
Shared filter		
No	1.0	
Yes	2.7	1.0–7.2
Shared drug solution		
No	1.0	
Yes	2.0	0.8–5.4

OR, odds ratio; CI, confidence interval.

There was no association between sharing needles and being HCV positive. There was an increased risk of being HCV antibody positive if people shared their spoons (OR 3.0, 95% CI 1.2–7.8) and sharing filters was close to statistical significance (OR 2.7, 95% CI 1.0–7.2) (Table 4).

Tattooing was an important risk factor for prisoners being HCV antibody positive. Prisoners who were HCV antibody positive were more likely to have a tattoo and to have had a tattoo in prison. The adjusted OR for having a tattoo in prison remained significant (OR 2.7, 95% CI 1.4–5.2) (Table 5). Importantly having had a tattoo in prison was a risk factor for prisoners with a history of injecting drug use (OR 2.2, 95% CI 1.1–4.5) and for prisoners who reported they had never injected drugs (OR 3.5, 95% CI 1.0–12.0). Being on methadone, either currently or in the past, was also associated with being HCV positive (Table 5).

Prisoners who were HCV antibody positive were younger (29.8 years compared to 34.2 years; $P < 0.001$), more likely to have injected drugs (OR 29.9, 95% CI 18.1–49.4) and to have injected for longer (11.7 years compared to 8.0 years; $P < 0.001$) and to have injected drugs in prison this time (OR 2.9, 95% CI 1.6–5.2). Being of Aboriginal and Torres Strait Island (ATSI) descent was also a risk factor in

those prisoners who reported never injecting drugs (OR 5.8, 95% CI 1.6–21.4). Having body piercings performed in prison was not associated with being HCV antibody positive.

DISCUSSION

Many prisoners in Victorian correctional facilities have a history of injecting drug use, are HCV antibody positive and continue to inject drugs whilst in prison, placing them at high risk of contracting or transmitting a BBV infection. The seroprevalence of prisoners who are HCV positive has increased from 39% in 1990/1991 [8] to 57.5% in this study although it is not possible to make a direct comparison because of different recruitment methodologies. The seroprevalence is also higher than generally reported in other Australian and international studies where the prevalence was between 30 and 40% [5–7, 9, 10]. There were 642 (29%) out of 2210 prisoners at ‘lock down’ who participated in the study. Although this percentage of prisoners seems relatively low, a high proportion of prisoners were not available to participate in the study due to work details both inside and outside the prison, depending on the prisoners and the prison’s security rating. Also it was not logistically possible to recruit prisoners who were in protection or extremely high-security areas of specific prisons. Therefore it was impossible to obtain a true denominator of the available prisoners. For this reason we compared our group with the total number of prisoners incarcerated in Victorian prisons in 2000. As can be seen in Table 1, there appears to be little difference between the prisoners who participated in our study and the total group of prisoners incarcerated in 2000. This makes it likely that the study results can be generalized to other prisoners. It is highly unlikely that prisoners would have been motivated to participate in the study to get their HCV result because the study was delinked and the results were not available to individual prisoners. Also prisoners can easily be screened at no cost for HCV and other BBVs at the prison hospital.

This is the first study conducted in a prison that has clearly identified tattooing in prison as an independent risk factor for HCV, regardless of whether the prisoners had ever injected drugs. Other studies have reported an increased risk of HIV, HBV and HCV among IDUs with tattoos with a history of incarceration [15, 19]. An Australian study reported tattooing as the most likely cause of two prisoners contracting

Table 5. Association of HCV antibody positivity among all prisoners*

Variable	Number HCV positive (%)	OR	95% CI	Adj. OR	95% CI
Gender					
Male	280 (55)	1.0		1.0	
Female	82 (67)	1.6	1.1–2.5	1.4	0.8–2.6
Age					
35+ years	80 (41)	1.0			
<35 years	278 (65)	2.7	1.9–3.8		
Duration of injecting					
Never	22 (11)	1.0		1.0	
<5 years	45 (62)	12.7	6.7–24.3	6.4	2.9–14.4
≥5 years	276 (83)	39.0	23.0–66.1	12.9	6.3–26.4
Time in prison so far this time					
≥10 months	133 (48)	1.0		1.0	
<10 months	212 (65)	2.0	1.4–2.8	1.6	0.9–2.7
Any tattoos					
No	62 (35)	1.0			
Yes	294 (67)	3.8	2.6–5.5		
Ever tattooed in prison					
No	240 (50)	1.0		1.0	
Yes	122 (81)	4.4	2.8–6.8	2.7	1.4–5.2
Ever tattooed at professional					
No	148 (48)	1.0			
Yes	214 (67)	2.2	1.6–3.1		
Ever inject in prison					
No	100 (32)	1.0			
Yes	262 (83)	10.9	7.4–15.9		
Inject this time in prison					
No	171 (41)	1.0		1.0	
Yes	191 (88)	10.5	6.7–16.6	3.0	1.7–5.5
Methadone					
Never	101 (36)	1.0		1.0	
Past	57 (93)	7.7	5.1–11.6	2.6	1.5–4.4
Current	184 (81)	25.5	9.0–72.4	11.3	2.6–50.2

OR, odds ratio; CI, confidence interval.

* Complete data was not available for all 362 HCV Ab positive prisoners. Data on age was available from 358 participants, time in prison from 345 participants, duration of injecting from 343 participants and tattooing from 356 participants.

HCV although injecting drug use could not be totally excluded [20].

Another important finding of this study was that injecting drug use in prison was an independent risk factor for HCV infection, suggesting that the context of injecting represents an increased risk of HCV transmission. This result is consistent with a previous study that reported injecting drugs in prison was associated with the increased presence of HBV antibodies [21]. This study clearly shows that prisoners who injected drugs outside of prison will continue to inject whilst in prison, regardless of the difficulties they may have in accessing drugs and injecting equipment.

The major difference is that they are less likely to inject safely, thus increasing their risk of contracting a BBV. Similar observations have been reported in other studies [16, 22, 23].

Prisons need to have effective harm-reduction strategies that benefit the prisoners during their time in the prison and following their release. This includes education about safe injecting and easy access to flexible drug-treatment programmes. Being on methadone was associated with being HCV positive; this is most likely a marker of these IDUs having a greater level of drug use in the past as there is evidence that drug treatment reduces injecting risk behaviours [16, 22].

Prisoners inject drugs less safely in prison compared to within the community. Community-based needle-and-syringe programmes (NSPs) have successfully reduced the risk of BBV transmission [24]. Needle-and-syringe exchange programmes are functioning in prisons in a number of European countries. The best evaluated programmes in Germany and Switzerland show positive effects not only in the reduction of sharing injecting equipment but also in increased referrals to drug rehabilitation programmes [25, 26]. The feasibility of introducing such programmes into Victorian prisons needs to be assessed.

Tattooing, a legal and regulated activity in the community, is illegal in prisons. Prisoners are being tattooed in an environment where there are limited (if any) infection control precautions to reduce the transmission of BBVs. Programmes need to be developed that reduce prisoners' need and desire to have a tattoo in prison. Although difficult and complex, a programme should be developed that allows legalized tattooing to occur in prisons.

Prisoner health care and the prevention of HCV transmission in prison are complex and sensitive issues but they can and should be solved. Injecting drug use and HCV in prisons is a public-health problem and a public-health opportunity. The majority of prisoners are incarcerated for less than 12 months after which they re-enter the community. The entire community, as well as individual prisoners, will benefit if we provide improved health care, disease prevention and harm reduction to this group. Other important interventions include vaccination for other hepatitis viruses, improved access to education, general health management and treatment for HCV.

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