

Risk factors for hepatitis C virus infection among injecting drug users in Sydney

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Abstract

Objective—To study risk factors for hepatitis C virus (HCV) infection in injecting drug users (IDUs) from central Sydney.

Setting and subjects—All IDUs attending a primary health care facility in central Sydney between December 1991 and November 1992 who underwent HCV antibody testing.

Methods—Information was obtained retrospectively from client forms routinely completed at the time of medical consultation. Additional information on injecting history and practice was obtained from the registration forms of subjects who also attended the needle syringe exchange programme at the same health care facility.

Results—Of the 201 IDUs tested, 118 (59%) had HCV antibodies, which did not differ significantly between males and females. HCV prevalence increased significantly with age, being highest in IDUs who were aged 35 years or more (93%) and lowest in IDUs aged under 20 years (17%). HCV prevalence increased significantly with time since first injecting, from 26% for IDUs who had injected for less than 3 years to 94% for those who had injected for more than 10 years. HCV prevalence was also significantly higher in heterosexual IDUs as compared with homosexual male IDUs, and in opiate users as compared with stimulant users, even after adjustment for age and duration of injecting. HCV prevalence was strongly associated with exposure to hepatitis B virus, but was not associated with exposure to HIV.

Conclusion—Recent HCV transmission indicates ongoing injecting risk behaviour despite HIV prevention efforts, and underlies the potential for increased transmission of HIV through the sharing of injecting equipment. Within the population of IDUs, those who are heterosexual or inject heroin appear to be at increased risk of HCV infection.

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Introduction

Since the development of antibody tests¹ to detect infection with the hepatitis C virus (HCV),² a number of surveys have established that the prevalence of HCV infection is greater than 70%, in people with a history of

injecting drug use.³⁻⁵ Transmission of HCV through blood transfusion has been largely eliminated through screening of blood donations in many developed countries,⁶ and although some studies have implicated the number of sexual partners as a risk factor,⁷ sexual transmission appears to be infrequent, particularly in comparison with hepatitis B infection.⁸ Injecting drug users (IDUs) therefore appear to be the primary group at risk of HCV infection in developed countries. HCV infection may therefore also be viewed as an indicator of the sharing of injecting equipment, and consequently as an indicator of HIV risk. Although HIV prevalence in Australian IDUs appears to have remained at a relatively low level,⁹ behavioural surveys have shown that the sharing of injecting equipment still occurs,¹⁰ despite the extensive implementation of HIV prevention programmes in the late 1980s.¹¹

In order to develop appropriate prevention strategies, it is important to identify current risk factors for HCV infection among IDUs. In previous studies, most of which have been in cohort study participants or long-term IDUs undergoing drug treatment programs, the only risk factor to emerge consistently has been the duration of injecting drug use.³⁻⁵ We undertook a study of HCV risk factors at the Kirketon Road Centre, a primary health care facility in central Sydney with a substantial proportion of IDUs among its clients.

Methods

Kirketon Road Centre (KRC) is a government funded facility established in 1987 to prevent and treat HIV and other transmissible infections in youth, sex workers and IDUs. In addition to medical care, KRC provides counselling, social welfare services and needle syringe exchange to clients. To the end of June 1993, more than 16,000 clients had attended KRC, 7,000 of whom reported a history of injecting drug use.

In December 1991 testing for antibodies to HCV became available in the context of clinical care at KRC, in addition to the existing provision of HIV and hepatitis B (HBV) screening. HCV testing was offered to all clients who reported a history of injecting drug use. All IDUs who underwent HCV testing at KRC from December 1991 until November 1992 were included in the study. If a client underwent more than one HCV test during this period, only the first test was included.

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Information on demographic characteristics, sexual practice, and drug injecting history and practice were obtained from the client's medical file at KRC. This information was recorded by the clinical practitioner for all clients at first clinic visit, and for all clients undergoing testing for HIV, HBV or HCV. HIV and hepatitis B status were obtained from laboratory reports in the client's medical file. For clients who also utilised KRC's needle syringe exchange programme (NSEP), injecting history and practice were recorded on the client's NSEP registration form. If information recorded in the medical file differed from that recorded at the time of registration for needle syringe exchange, the medical file information was held to be most accurate, on the grounds that it was obtained through discussion between client and practitioner. In contrast, information was obtained by client-answered questionnaire at needle syringe exchange registration.

All behavioural information recorded at first clinic visit referred to risk behaviour up until that visit. Information recorded at the time of testing for HIV, HBV or HCV referred to the 12-month period before the visit for the first test.

Study subjects were assessed as being "regular" or "occasional" IDUs, on the basis of whether or not they injected drugs more fre-

quently than once a month at the time of HCV antibody testing. Drugs injected were grouped as either "opiates", which included heroin and methadone or "stimulants", which included amphetamines and cocaine.

HCV antibody testing was by the Monolisa R (ELISA) test, a second-generation ELISA¹² manufactured by SANOFI Diagnostics Pasteur.

Associations between HCV prevalence and individual client characteristics were assessed using the chi square tests.¹³ For factors which emerged as significantly associated with HCV prevalence in univariate analyses, multivariate analyses were carried out, using multiple logistic regression.¹⁴

Results

During the study period, HCV antibody testing was carried out on 201 KRC clients who gave a history of injecting use. Of these subjects, 94 (47%) were male and 107 (53%) were female; 30 (15%) were aged under 20 and 62 (31%) were 30 or over. The mean age of the study subjects was 26.9 years (SD 6.63) and the age range was 15.6 to 44 years.

The association between demographic characteristics and HCV prevalence is summarised in table 1. The overall prevalence of HCV infection was 59% and did not differ significantly between males (55%) and females (63%) at the 0.05 level. The prevalence was highest in IDUs who were aged 35 years and over (93%), and lowest in IDUs under 20 years (17%). Age was significantly associated with HCV prevalence ($p < 0.001$).

Table 1 also shows other characteristics of IDUs and their association with HCV prevalence. The infection rate was highest for IDUs who had commenced injecting at least 10 years previously (94%), and lowest for IDUs who had commenced injecting within 3 years (26%). Years since first injecting was significantly associated with prevalence ($p < 0.001$).

Prevalence was higher in IDUs who reported regular injecting drug use (67%) than in those who reported occasional use (40%), a difference which was significant. Opiate users had a higher prevalence (74%), than stimulant users (22%), and prevalence was intermediate for IDUs who injected both opiates and stimulants. These differences were significant ($p < 0.001$). Although a report of sharing injecting equipment was significantly associated with HCV prevalence, prevalence was still substantial (38%) in IDUs who reported never having shared injecting equipment.

Prevalence was highest ($p < 0.01$) in IDUs whose sexual practice was heterosexual (70% for both males and females) and lowest in male IDUs whose practice was homosexual (35%). Involvement in commercial sex work was reported by 47% of the study subjects. HCV prevalence was slightly lower in subjects with a history of sex work (56% vs 62%), but this difference was not significant ($p = 0.5$).

There was no significant difference in HCV prevalence between IDUs who were negative

Table 1 Univariate analyses of HCV prevalence among 201 IDUs attending Kirketon Road Centre

Characteristic	Number	HCV prevalence (%)	95% Confidence intervals	p-value*
Sex				
Male	94	55	(45-65)	
Female	107	63	(53-72)	0.3
Age Group				
15-19	30	17	(3.3-30)	
20-24	65	51	(39-63)	
25-29	44	70	(57-84)	
30-34	33	70	(54-85)	
35 +	29	93	(84-100)	<0.001
Years since first injecting				
<3	50	26	(14-38)	
3-6	29	38	(20-56)	
6-10	34	62	(45-78)	
10 +	36	94	(87-100)	
Unknown	52	77	(66-88)	<0.001
Frequency of injecting				
Occasional	48	40	(26-53)	
Regular	130	67	(59-75)	
Unknown	23	57	(36-77)	0.004
Drug injected				
Stimulants only	37	22	(8.4-35)	
Opiates only	70	74	(52-74)	
Both	76	63	(52-74)	
Unknown	18	61	(39-84)	<0.001
Sharing of injecting equipment				
Never	40	38	(22-53)	
Ever	147	65	(57-72)	
Unknown	14	36	(39-89)	0.003
Sexual practice				
Homosexual	20	35	(14-56)	
Bisexual	41	56	(41-71)	
Heterosexual	107	70	(61-79)	
Unknown	33	42	(26-59)	<0.001
Involvement in Sex Work				
No	107	62	(52-71)	
Yes	94	56	(46-66)	0.54
HIV infection				
Negative	180	60	(53-67)	
Positive	14	57	(31-83)	
Unknown	7	43	(6.2-80)	0.66
HBV infection				
Unexposed	103	42	(32-51)	
Exposed	95	78	(70-86)	
Unknown	3	67	(13-100)	<0.001

* p value = the significance of the difference in HCV prevalence between the levels of the factor indicated.

Table 2 Multivariate logistic regression analyses of HCV prevalence among IDUs attending Kyrketon Road Centre

Characteristic	Odds Ratio	95% Confidence intervals	p-value*
Years since first injecting			
<3	1.0		
3-6	1.1	(0.34-3.8)	
7-10	2.6	(0.83-8.4)	
10+	19.3	(2.9-130)	
Unknown	7.5	(2.1-27)	0.001
Drug injected			
Stimulants only	1.0		
Heroin only	5.9	(1.8-19)	
Both	5.5	(1.7-17)	
Unknown	3.4	(0.64-18)	0.011
Sexual practice			
Homosexual	1.0		
Bisexual	3.3	(0.76-14)	
Heterosexual	4.9	(1.3-19)	
Unknown	1.4	(0.32-6.4)	0.026
Age			
15-19	1.0		
20-24	4.5	(1.2-16)	
25-29	5.0	(1.2-20)	
30-34	3.5	(0.72-16)	
35+	12.7	(1.5-105)	0.064
Frequency of injecting			
Occasional	1.0		
Regular	1.7	(0.67-4.7)	
Unknown	1.0	(0.22-4.4)	0.458

* p value = the significance of the difference in HCV prevalence between the levels of the factor indicated, when all other factors in the table are included in the logistic model.

for HIV antibody and those who were positive. On the other hand, exposure to HBV, as defined by the serological presence of hepatitis B antigen and/or hepatitis B core antibody was strongly associated with HCV. Prevalence was 78% among IDUs exposed to HBV and 42% among unexposed IDUs ($p < 0.001$).

A number of the factors considered in table 1 were associated with each other. People who only injected stimulants had begun injecting much more recently than other IDUs (4 years vs 8 years), included more homosexual men (32% vs 21%) and were less likely to be regular users (50% vs 77%). Homosexual male IDUs had begun injecting more recently than other IDUs (6 years vs 7 years). Age and sex differed relatively little between these categories of IDUs.

In multivariate analyses using logistic regression, variables which emerged as significantly associated with HCV prevalence in the univariate analyses were assessed simultaneously. Variables considered in these analyses were duration of time since first injecting, age, sexual practice, drug injected, and frequency of injecting. The results of this simultaneous analysis are reported in table 2. The strongest association (in the multivariate analysis) was with number of years since first injecting, but drug injected and sexual practice remained significantly associated with HCV prevalence. Sexual practice was significantly associated with HCV prevalence when heterosexual IDUs were compared with homosexual male IDUs. HCV prevalence was also significantly higher among opiate users and those who used both stimulants and opiates, than in the group who only injected stimulants.

Discussion

The findings in this study are consistent with previous reports from Australia^{3,4} and other countries⁵ in identifying a high prevalence of HCV infection among IDUs, and a strong

association with the duration of time since first injecting.^{3,4,5} In addition, HCV infection was strongly associated with the injection of opiates, as opposed to stimulants, and occurred more frequently in heterosexual IDUs (male and female) than in male IDUs whose sexual practice was homosexual. A unique feature of this study was recruitment of IDU subjects in a primary health care setting. In comparison, other studies of HCV risk factors have generally involved IDUs seeking treatment for drug dependence, or specifically enrolled in cohort studies.

Several methodological issues need to be considered in the interpretation of these results. No information was available on IDUs seen at KRC during the study period and not tested for HCV. However, it is unlikely that infection status had an influence on the likelihood of accepting testing, as most IDUs attending KRC prior to the study period would not have been tested. Several of the subgroups in the study were numerically small. For example, there were only 47 male subjects whose sexual practice was homosexual or bisexual. Furthermore, a number of the characteristics under investigation were strongly associated among themselves. In particular, men whose sexual practice was homosexual were younger, had begun injecting more recently, and used stimulants more frequently than the heterosexual IDUs in the study. To the extent possible, the multiple logistic analysis has provided an adjustment for the potential confounding arising from these associations, but it is possible that some bias remains in the adjusted estimates, to an extent that can not be readily evaluated.

Another methodological limitation to the study is the dependence on self-report for information on injecting and sexual practice. The HCV prevalence of 38% among IDUs who reported never having shared injecting equipment may reflect this limitation. Misclassification of variables has the effect of reducing the apparent size of any association,¹⁵ provided the extent of misclassification was not associated with HCV status or the true values of the variables. There is no way to assess this issue on the basis of available data. Since most of the IDUs in the study would never have been previously tested for HCV infection, it is unlikely that infection status had an influence on the validity of self-report.

The associations observed in this study have a number of important implications for the prevention not only of HCV but also of other parenterally transmitted infections, particularly HIV. Firstly, it is clear that HCV transmission is continuing to occur among the IDUs represented by the study population, with a prevalence of 26% reached within three years of first injecting. There is nevertheless some indication of a reduction in transmission when the findings are compared with those of Bell *et al*⁴ who found an even higher prevalence of HCV among IDUs in Sydney who had begun injecting within the past two years (66%). This reduction may be explained in part by the fact that the second-generation

ELISA, used for detecting HCV infection in the present study, has a higher specificity¹² than the first generation ELISAs used in earlier studies of HCV in IDUs. The prevalence may also be higher in the earlier study because it included subjects identified between 1986 and 1989, and generally before needle exchange and other prevention programmes were well established. However, the occurrence of HCV transmission in more recent years suggests that these programmes have not yet been fully effective in eliminating needle sharing among IDUs.

A second important conclusion from this study is that within the population of IDUs, there are distinct subgroups of HCV prevalence. Heterosexual IDUs and those who inject heroin appear to be at increased risk, apparently independently of the duration of time since first injecting. In contrast, other Australian studies have suggested that HIV risk has been higher in homosexual men who injected drugs than in other IDUs.⁹

These findings also have implications regarding the extent to which HCV is sexually transmissible. If most cases of HCV were acquired through sharing of injecting equipment, rather than sexually, the differences in HCV infection patterns among subgroups of IDUs observed in the present study may reflect real differences in injecting practices, including the extent of needle sharing and the choice of partners with whom needle sharing has taken place. For example, homosexual male IDUs may have a lower HCV prevalence if they adopted safer injecting practices, in parallel with the apparent adoption of safer sexual practices among homosexual men in Sydney,¹⁶ to a greater extent than other IDUs. On the other hand, the low rate of HIV among heterosexual IDUs may also be due to a relatively small pool of HIV infection in this population at this stage in Sydney. If so, the high prevalence of HCV, indicating ongoing injecting risk behaviour, demonstrates the potential for HIV transmission to increase, should the pool of HIV infection reach a criti-

cal size.¹⁷ Conversely, the higher prevalence of HIV infection among male homosexual IDUs in Sydney may have represented a greater risk for the acquisition of HIV through sexual contact than the risk of transmission by sharing equipment.

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