HEPATITIS C PREVALENCE AND RISK BEHAVIOR OF INJECTING DRUG USERS IN SYDNEY: A CONTINUING CONCERN

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Abstract. This study examines patterns of injecting drug use and hepatitis C (HCV) risk behavior among injecting drug users. A survey of injecting drug users attending needle and syringe programs (NSPs) in the Sydney metropolitan area and members of NSW Users and AIDS Association (NUAA) yielded 336 responses. Demographic, behavioral and drug-use information was collected from injecting drug users aged from 14 to 64 years. The majority of respondents (66%) were HCV positive, 28% had tested negative and 5% did not know their status. Prevalence was higher among men than among women (54% *vs* 44%). Two thirds of respondents (72%) reported frequent heroin injection. Multivariate analysis identified the following significant risk factors for hepatitis C: being more than 30 years of age, an injecting history of five years or more, and having shared drug injecting equipment with a HCV positive user. The most significant factor associated with needle sharing was having unprotected sex with sexual partners and having a positive hepatitis C test result. Early identification of these factors should be a component of HCV prevention programs. Our data indicate that the promotion of safer injecting continues to be an important public health issue with regard to reducing HCV infections.

INTRODUCTION

Injecting drug use has long been recognized as the most significant risk factor in the spread of hepatitis C virus (HCV) (Crofts *et al*, 1997; Loxley *et al*, 1997a; Wodak, 1997a; Watson, 2000). In the current decade the transmission of hepatitis C associated with injecting drug use (IDU) and the sharing of drug injecting equipment has become an increasingly serious public health problem in Australia (Hulse, 1997; Cregan, 1998; Van De Van *et al*, 1999; Gupta *et al*, 2000). It is estimated that as a result of injecting drug use, at least 190,000 Australians are currently infected with hepatitis C and 11,000 new infections related to injecting drug use occur each year in a country with a population of only 18 million (Wodak and Crofts, 1994; Crofts *et al*, 1997; 1999; Orr and Leeder, 1998). A recent report of the National Center for HIV Epidemiology and Clinical Research (NCHECR, 2000) reveals hepatitis C prevalence (based on a finger prick test) as 50% among the injecting drug users attending needle and syringe programs in 1999. In the same year, there were 21,409 notified cases throughout Australia, although many people with hepatitis C infection remain undiagnosed. Since an antibody test for hepatitis C became available in 1990, high rates of hepatitis C infection have been identified in almost all IDU populations studied: 90% or more in most methadone clinics Australia wide and 30-80% among research and clinic samples (Crofts *et al*, 1993; Carruthers *et al*, 1997). This overwhelmingly suggests that exposure to the HCV is much more common among Australian IDUs with at least 85-90% of infections occurring among injecting drug users (Wodak, 1997b; Cregan, 1998).

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There have been few studies (Bell *et al*, 1990; Bodsworth *et al*, 1996; Van Beek *et al*, 1994; 1998; Crofts *et al*, 1997; Loxley *et al*, 1997a) examining risk factors in HCV infection among IDUs in Sydney, and most studies were small, cross-sectional, retrospective and follow-up of patients. Information is needed in detail about changes in IDU risk behavior and the prevalence of infection of HCV among Sydney IDUs. In the second decade of harm reduction, promoting safer injecting behavior continues to be an important public health issue. Despite the range of HCV initiatives modeled on those adopted to counter the HIV epidemic, a large percentage of injecting drug users still share injecting equipment and follow other dangerous practices (Lenton and Tan-Quigley, 1997; MacDonald *et al*, 1997; Crofts and Aitken, 1997). It is timely to assess what further intervention work can be carried out to sustain achievements to reduce rates of HCV (SCSI, 1998). To devise more specific preventative measures, information is needed about the prevalence and patterns of injection and other risk-taking behavior among IDUs, recognizing that the context may differ significantly from earlier longitudinal and cross-sectional studies. Given the significance of HCV for IDUs, we therefore present a study of the risk factors associated with self-reported HCV status of persons who attend needle and syringe outlets in Sydney metropolitan area. This study describes the current state of the hepatitis epidemic and associated risk factors and explores the reasons given by the injecting drug using community in Sydney for engaging in HCV risk-taking behavior.

MATERIALS AND METHODS

Participants were recruited directly by approaching clients of NSPs and by a mail survey sent to members of the New South Wales (NSW) Users and AIDS Association (NUAA). NUAA is a state-wide community-based organization representing the health and social needs of injecting drug users, which provides free injecting equipment, including filters and specialized injecting items and safe sex equipment. Of the 336 respondents, 274 persons were recruited at ten NSPs in the Sydney metropolitan area and at two methadone clinics [NUAA NSP, Newtown NSP, KRC, Ryde NSP, Langton Center, St George NSP, St Marys CHC, Foley House, Liverpool Mobile Exchange, Canterbury HIV Prevention Unit, Kobi Methadone]. An advertisement placed with these agencies invited participation and assured anonymity to participants. The same questionnaire was also mailed to 150 members of NUAA, the majority of whom identified as current injecting drug users. An explanatory letter which described the aims of the study was mailed out with the questionnaire. The members who returned the questionnaire and reported currently not injecting drugs were considered ineligible and were excluded from the study sample. This latter approach yielded 62 completed questionnaires mailed to NUAA. The analysis reported in this paper, therefore, is based on the data from the 336 (274+62) respondents from NSPs and those who completed and returned the questionnaire. All respondents were current injecting drug users. To obtain a geographically representative sample from the Sydney metropolitan area, participants were recruited from the inner, eastern, northern and western suburbs, geographical areas which cover a wide range from negative affluence to social deprivation.

The questionnaire sought information about demographic characteristics, injecting and sexual behavior, patterns of drug use, HCV information, HCV antibody testing and HCV risk behavior. Moreover, in seeking to identify factors associated with exposure to hepatitis C, we also analysed the following factors: age, sex, educational background, duration of injecting drug use, injection frequency and needle sharing. The final section of the questionnaire contained specific questions relating to the level of risk the individual encountered when participating in specific behavior practices. Response possibilities ranged from closed options to open-ended questions. The survey was conducted during the six months period from January to June, 1998.

Data were analysed using SPSS for Windows and statistical differences of association were analysed using chi-square test. The χ^2 test was used to assess differences in categorical data. For the purposes of χ^2 analyses of associations with gender status, transgender was excluded from the group to meet conventional cell frequency requirements (Table 5). Variables found to be significant or approaching significance were evaluated in multivariate analysis by logistic regression. The selection of variables for inclusion into a multiple logistic model was based on prior knowledge and univariate analysis results. Odds ratios and confidence intervals at the 95% level are given where appropriate. The statistical software also used to produce descriptive measures of proportion, central tendency and variation of factors examined and to generate some non-parametric measures of significance.

Table 1
Demographics.

Characteristics	Frequency N = 336	Percentage
Gender		
Male	172	51.2
Female	157	46.7
Transgender	5	1.5
Not reported	2	0.6
Age group (years)		
20 and under	16	4.8
21 - 25	62	18.5
26 - 30	71	21.1
31+	187	55.6
Age of first injection		
15 and under	84	25.0
16 - 20	163	48.5
21 - 25	65	19.3
26 - 30	16	4.8
31+	6	1.8
Not reported	2	0.6

RESULTS

The respondents divided almost equally on gender lines: 172 (51%) male, 157 (46%) female and a small number, five (2%), identified as transgender. The respondents' ages ranged from 14 to 64 years at the time of survey, with a mean of 32 years. Men were on average two years older than the female respondents. Respondents were mostly in their late 20s and 30s, predominantly male in the 31-40 group and female in the 21-30 age group (Table 1). Eighty-one percent of the sample were born in Australia, 8% were born in New Zealand and 5% were born in England. Ninety-one percent of participants were in a methadone treatment program at the time of the survey, and a further 9% were involved in some other form of treatment.

First injection

The average age at which these drug users had first injected themselves or been injected by someone else was 18.5 years. This did not differ significantly between males and females (mean age for male 18.5, SD 4.5 compare to female 18.7, SD 4.11), and nor did the length of time (male 13.9, SD 6.8 *vs* female 12.0, SD 7.0) since the first injection. Compared to female drug users (≤ 25-year-olds), males were slightly younger. No significant variation was observed between males and females with respect to this age group ($\chi^2 = 3.10$, df = 1, $p = 0.078$).

Twenty-five percent (n = 84) of the participants stated they first injected drugs before they were 16 years old and among those participants, 7% (n = 22) started when they were between 11 and 13 years old. The majority of drug users started injecting drugs between 16 and 24 years, the peak being between 18 and 22 years (Table 1). Among the users who have been injecting for five or more years, 17% started injecting before they were 25 years old.

Length of time of injecting

The length of time of injecting has been calculated from the difference between the current age of respondents and their age of first injection. The majority (98%) had been injecting drugs for more than one year with

a median duration of drug use of 13 years. Almost 2% of the sample had been injecting drugs for less than one year with a median of 20 times per month. Three percent reported injecting for less than three years and 62% had been injecting for more than ten years. There was no significant difference between the male and female respondents in terms of the variations in the duration of injecting ($\chi^2 = 6.29$, df = 2, p = 0.043).

Table 2 lists the drugs injected by respondents. The most commonly injected drug was heroin (72%), followed by methadone (28%), speed (19%), cocaine (10%), ecstasy (0.9%) and morphine (1.2%). Other drugs were reported to be injected by 5% of the sample. Among those who had used other drugs, the majority (29%) had used minor tranquillizers (known as benzodiazepine). Other types of opiates (17.6%) were also commonly used, with cannabis, oxblood and palfium use being almost similar (6.0% respectively).

Poly-drug use

Poly-drug use (defined as the use of two or more of the drug types) was common among the sample as can be seen in Table 2. The mean number of different drugs ever used by the sample was two with a SD of 0.3 (range = 1). Among the poly-drug users only 10% of participants (n = 6) indicatd that they often injected more than two drugs. Most injecting users combined heroin or methadone with speed and other drugs.

Table 2
Drugs injected by respondents.

Drugs	Frequency N = 336	Percentage
Heroin	240	72.0
Methadone	94	28.2
Speed	62	18.6
Cocaine	33	9.9
Morphine	4	1.2
Ecstasy	3	0.9
Other	17	5.1

Note: These categories are not mutually exclusive.

Hepatitis C status

Table 3 displays the prevalence of participants who reported that they had tested positive to hepatitis C antibodies. Of the respondents who had been tested for the virus (n = 312), 66% (n = 207) reported that they were anti-HCV positive. Of these, 54% were male, 44% were female, 2% were transgender, and 1% did not report their gender. Overall, 65% of males in the sample, 59% of females, and 80% of transgendered individuals reported that they were infected with hepatitis C. Twenty-eight percent of the sample (n = 88/312) reported that they were anti-HCV negative, and 5% (n = 16) reported that their HCV status was unknown. Of the entire sample, 7% (n = 24/336) reported that they had never been tested for HCV infection and 1 did not respond to the question.

Variables associated with hepatitis C status are shown in Table 4. Table 4 shows that both older users and those injecting for 5 years or more were more likely than younger users to become infected with hepatitis C. Further analysis by chi-square tests showed that hepatitis C positive and negative users differed in terms of the history of needle sharing (p = 0.000). Table 4 describes the levels of demographic characteristics by each category and relevant

Table 3
Self-reported hepatitis C status by gender (n = 208).

Total[a] anti-HCV positive	Male anti-HCV positive	Female anti-HCV positive	Transgender anti-HCV positive
207	111	92	4
66.0%	54.0%	44.0%	2.0%

[a]Data was missing on this item for one person.

Table 4
Demographic characteristics and risk behavior of injecting drug users for HCV.

Variable	HCV positive	HCV negative	χ^2	Significance
Total number of subjects[a]	70% (208/296)	30% (88/296)	87.19	p = 0.04
Age in years	33.2 (SD 6.6)	28.4 (SD 6.7)		
Gender[b]				
Male	55% (111/203)	46% (40/87)	1.85	p = 0.2
Female	45% (92/203)	54% (47/87)		
Age				
Up to 25 years	32.% (67/208)	67% (59/88)	30.69	p = 0.00
Over 25 years	68% (141/208)	33% (29/88)		
Duration of injecting				
Less than 5 years	4% (8/208)	24% (21/87)	28.50	p = 0.00
More than 5 years	96% (200/208)	76% (66/87)		
Needle sharing				
Yes	77% (158/206)	53% (47/88)	15.85	p = 0.00
No	23% (48/206)	47% (41/88)		
Current treatment history				
Yes	68% (141/208)	61% (53/87)	1.29	p = 0.3
No	32% (67/208)	39% (34/87)		
Duration on methadone				
<1 year	18% (20/114)	10% (5/48)	1.32	p = 0.3
>1 year	82% (94/114)	90% (43/48)		
Prison history				
Yes	55% (113/206)	44% (38/87)	3.06	p = 0.08
No	45% (93/206)	56% (49/87)		
Professional tattoos				
Yes	40% (81/204)	48% (42/88)	1.62	p = 0.2
No	60% (123/204)	52% (46/88)		
Professional body piercing				
Yes	27% (54/203)	36% (32/88)	2.81	p = 0.09
No	73% (149/203)	64% (56/88)		
Blood transfusion before1990				
Yes	10% (20/202)	6% (5/86)	1.27	p = 0.3
No	90% (182/202)	94% (81/86)		
Unprotected sex				
Yes	87% (178/205)	83% (72/87)	0.82	p = 0.4
No	90% (27/205)	17% (15/87)		

[a]Total excludes people whose test result was reported as unknown, as the number is too few to allow analysis.
[b]Total excludes people whose sex was reported as transgender, as the number is too few to allow analysis.

p-values.

Hepatitis C risk behavior

A range of risk behaviors was described by respondents. The great majority (92%) had re-used needles/syringes. Just over two thirds (67%) had shared needles/syringes and 81% had shared other drug injecting equipment such as spoons, filters, tourniquet, water and swabs in the past. Of those who said they had shared needles or syringes, 74% reported that they were anti-HCV positive. In order to consider the time of injecting participants were asked when was the last time they used a needle/ syringe or equipment after someone else. Twenty-two participants (22/101) said they had

shared in the past week; while five had shared in the past month. Of those who said they had shared in the past week, only 3% said they shared the day before survey and an additional 3% reported that they had shared on the actual day of survey.

Among the sharers, 30% of the respondents (n = 98) recalled sharing needles/syringes with someone whom they knew was hepatitis C positive. And 15 respondents (5%) had shared needles/syringes with someone they knew to be HIV sero-positive. Of the subjects who had knowingly shared with seropositive persons (hepatitis C or HIV), 74% (75/101) reported they were anti-HCV positive, although it is not known whether they tested positive before or after they had shared equipment with someone they knew was positive.

Predictors of needle sharing

A multiple logistic regression analysis was conducted in order to determine significant predictors of needle sharing. A range of variables were entered into the model including socio-demographics, drug use, risk-taking behavior, and knowledge of the contraction and symptoms of hepatitis C. A Forward-stepwise procedure was utilized to formulate the model.

The results from the logistic regression analysis showed that there were two predictors of needle sharing. The model indicated that having unprotected sex increased the odds of needle sharing by 1.6 (CI 1.0 - 2.5, $p < 0.05$), and that having a positive hepatitis C test result increased the odds of needle sharing by 2.1 (CI 1.3 - 3.4, $p < 0.01$). This model was significant ($\chi^2 = 56$, df = 2, $p < 0.001$). Overall, 69% of the sample were correctly classified by the final model, and the Hosmer-Lemeshow (1989) goodness-of-fit statistic was 3.7 on 2 df ($p = 0.16$), indicating that the model fitted the observed data well.

Predictors of risk for exposure to hepatitis C

A multiple logistic regression analysis was conducted in order to determine significant predictors of a hepatitis C test result. A range of variables were entered into the model socio-demographics (*eg* age, gender, education level); drug use (*eg* age when first injected, duration of injecting); risk behavior (*eg* needle sharing, tattooing, body piercing, blood transfusion prior to 1990, unprotected sex, razors or toothbrush sharing, needle sharing with a HCV or HIV carrier); knowledge of the contraction of hepatitis C; and other miscellaneous factors (*eg* treatment seeking, having been incarcerated). The categorical nature of these variables can be seen in Table 5, which displays the results from the logistic regression analysis. There were four significant predictors of a hepatitis C positive test. The model indicated that being <30 years of age decreased the odds of being hepatitis C positive by 2.34 (CI 1.20 - 4.54, $p < 0.02$); injecting for greater than 5 years increased the odds of being hepatitis C positive by 2.73 (CI 1.15 - 6.48, $p < 0.03$). The model also indicated that needle sharing with hepatitis C positive user increased the odds of a hepatitis C positive test result by 2.24 (CI 1.03 - 4.85, $p < 0.05$); and finally, needle sharing with a HIV positive user decreased the odds of a HCV positive test result by 0.24 (CI 0.06 - 0.98, $p < 0.05$). The regression model was significant ($\chi^2 = 84$, df = 16, $p < 0.001$). Overall, 76% of the sample were correctly classified by the final model, and the Hosmer-Lemeshow (1989) goodness-of-fit statistic was 7.3 on 8 df ($p = 0.51$) indicating that the model fitted the observed data well.

Rationale for sharing needles

Respondents gave some reasons for past sharing of injecting equipment (see Table 6). The most frequently cited reason (57%) was the unavailability of new clean equipment. In addition, 30 subjects (10%) stated that the reason they shared injection equipment was because of the difficulty in obtaining a new fit. While 57% claimed to have shared because of the unavailability of sterile needles, only 4% claimed to have shared for financial reasons and 3% of the fear of legal danger (Table 6). Buying needles in a pharmacy was also

Table 5
Predictors of risk exposure to hepatitis C for IDUs.

Risk predictor	Total population n (%)	Of whom hep C positive n (%)	Odds ratio	95% CI	p-value
Age (years)					
<30	133 (40)	60 (45)	1	1.20-4.54	0.01
≥30	203 (60)	61 (72)	2.34		
Age of first injection					
<20 years	220 (66)	144 (65)	1	0.41-1.62	0.6
≥20 years	114 (34)	64 (56)	0.82		
Gender					
Male	172 (52)	111 (65)	1	0.41-1.48	0.4
Female	157 (48)	92 (59)	0.78		
Duration of injecting					
Up to 5 years	54 (16)	13 (24)	1	1.15-6.48	0.02
More than 5 years	280 (84)	195 (70)	2.73		
Education					
No high school	152 (46)	94 (62)	1	0.35-1.83	0.6
High school and more	179 (54)	110 (61)	0.80		
Treatment history					
Yes	214 (64)	141 (66)	1	0.46-1.57	0.6
No	121 (36)	67 (55)	0.85		
Prison history					
Yes	163 (49)	113 (69)	1	0.51-1.77	0.9
No	170 (51)	93 (55)	0.95		
Hep C knowledge					
≤75%	172 (51)	127 (74)	1	0.41-1.49	0.5
>75%	164 (49)	81 (49)	0.78		
Shared needles					
Yes	223 (67)	158 (71)	1	0.82-3.14	0.2
No	111 (33)	48 (43)	1.60		
Professional tattooing					
Yes	137 (41)	81 (59)	1	0.39-1.31	0.3
No	195 (59)	123 (63)	0.71		
Professional body piercing					
Yes	98 (30)	54 (55)	1	0.35-1.38	0.2
No	233 (70)	149 (64)	0.69		
Unprotected sex					
Yes	280 (84)	178 (64)	1	0.56-2.79	0.6
No	52 (16)	27 (52)	1.26		
Blood transfusion before 1990					
Yes	29 (9)	20 (69)	1	0.37-3.82	0.8
No	298 (91)	182 (61)	1.18		
Shared razors/toothbrushes					
Yes	175 (53)	111 (63)	1	0.34-1.26	0.2
No	157 (47)	94 (60)	0.65		
Knowingly shared with Hep C+					
Yes	98 (36)	73 (75)	1	1.03-4.85	0.04
No	178 (64)	111 (62)	2.24		
Knowingly shared with HIV+					
Yes	15 (6)	7 (47)	1	0.06-0.98	< 0.05
No	257 (94)	174 (68)	0.24		

Hosmer-Lemeshow $\chi^2 = 7.26$, $p = 0.51$ (note: high p-values indicate better goodness of fit).

Table 6
Reasons for past sharing of injecting equipment (n = 292).

	Frequency N = 297	Percentage
A new fit was unavailable	191	64.3
It was too inconvenient to get a new fit	33	11.1
Could not afford to buy a new fit	12	4.0
Chemist would not sell a fit	14	4.7
Legal dangers of buying a fit	10	3.4
Needed a shot	7	2.4
Longstanding partner	12	4.0
Both Hep C positive	4	1.4
Did not consider risk	3	1.1
Empty vending machine	4	1.4
Long before NSP	7	2.4

These categories are not mutually exclusive.

perceived to be difficult (4%) with several respondents commenting that the cost of needles in a pharmacy was prohibitive. Less commonly mentioned reasons given were the unavailability of fits before NSPs were operating and vending machines being empty.

DISCUSSION

Several limitations of our study should be acknowledged. First, hepatitis C status, injecting risk and other behavioral data were self-reported. Self-report of hepatitis C status may be argued to be of uncertain reliability.

Second, the sample was self-selected and there were basically two methods of recruitment to the study – a self-administered questionnaire distributed to clients at NSPs and the same questionnaire mailed to NUAA members. Therefore, the two types of recruitment do not form a homogeneous sample representative of injecting drug users. Hepatitis C risk behavior of those subjects who were NUAA members and were not accessing NSPs or treatment facilities might have occurred more frequently.

Third, respondents were asked to recall risk practices over a number of years and this could result in under-reporting. The count of protective or risk factors involved may be somewhat unreliable.

Fourth, the sample in this study was small and the respondents were recruited in non-equal numbers from each needle and syringe program. It is impossible to determine how representative this sample was of the general population of injecting drug users and hence the generality of findings is quite limited.

The prevalence of recent hepatitis C among the sample (66%) shows a consistent pattern in the range 50% to 70% in different populations of IDUs over the last few years (Van Beek, 1998; Carruthers *et al*, 1997; Crofts *et al*, 1993). However, the findings of this study differed from a recent survey of NSP clients (MacDonald *et al*, 2000), in that a lower proportion of infection has occurred in Australian IDUs (50%). It is possible that our sample contains an over-representation of older opiate-dependents (18%) from two methadone treatment settings, who were more likely to be infected by HCV. Although the prevalence is higher in our sample, it is consistent (68%), with the result of a 1998 survey, the year when our survey was done, among NSP clients in New South Wales. Compare to the prevalence rate in 1998, the findings in this study indicate that HCV infection is declining among IDUs. The current study is therefore consistent with

research indicating the efficacy of harm reduction measures in reducing hepatitis C. The continued monitoring of exposure to the hepatitis C virus in users at NSPs and methadone clinics may be a useful way of assessing the change in needle sharing behavior . However, such findings need to be interpreted with care, in the light of the small sample size and consequent lack of power of the study to detect differences between the HCV positive and negative IDUs.

When current hepatitis C prevalence was considered it was found that many of those who reported positive for HCV became infected by injecting drug use in the 1970s and 1980s (NHMRC, 1997; Watson *et al*, 1999). We found that 9.2% users had received at least one blood transfusion before 1990. Since the screening of blood donors for antibody HCV began in Australia in early 1990, the risk of transmission of HCV through the blood supply has decreased markedly.

Although the sharing of needles is the most likely means by which these people were exposed to hepatitis C, a smaller proportion became infected by having had a blood transfusion, tattoo or decorative body piercing. While tattooing and body piercing were not independently predictive of exposure to hepatitis C virus, it may be that the sample in this study was too small to detect such an influence.

The incidence of hepatitis C is related to length of time of using injecting drugs ($\chi^2 = 28.5$, df = 1, $p < 0.001$). Age was also found to be associated with HCV prevalence primarily through its association with duration of injecting ($\chi^2 = 30.7$, df = 1, $p < 0.001$). The seroprevalence for hepatitis C in the younger age group (≤ 30) was 32% and in the older group (30+) 68%, which supports the association of hepatitis C with duration of injecting which has been found in other studies (Loxley *et al*, 1997b; Van Beek *et al*, 1998; MacDonald *et al*, 2000). The demonstrated association of HCV prevalence with a long duration of injecting explains the continuing risk over the IDU's injecting career. These data confirm that the high prevalence (29%, 60/208) of hepatitis C virus among subjects under 30 years of age is a major public health concern. The early spread poses an enormous challenge to the harm reduction programs. The continued high prevalence of HCV infection among injecting drug users, especially amongst younger users indicates that new infections are continuing to occur.

Two thirds of those surveyed (66.1%) reported heroin as their usual drug and 27% used oral or injected methadone. Injection of amphetamines and cocaine was lower (18% and 9% respectively). The high usage of injected heroin suggests a higher likelihood of sharing of needles/syringes and consequent hepatitis C infection. Heroin users are more likely to be infected than users of amphetamines or other drugs, probably because amphetamine users traditionally have been less inclined to share needles. Other research data support the view that the higher the frequency of heroin use, the higher the risk of sharing (Darke *et al*, 1990; Griffiths *et al*, 1994).

Approximately 40% of the sample had reused their own needles in the Fitpack which has implications for the possibility of accidental sharing when using with others. It also suggests that there may be a need to review the effectiveness of 'new fit for every hit' message. This data suggest other factors such as the price and availability of needles may affect re-use and sharing of needles.

A large proportion of users reported that they shared needles/syringes because of the unavailability of new fits (needle and syringe) at the time of injection. We found a significant percentage of users who had shared with someone whom they knew to be hepatitis C or HIV positive. Just over one quarter of all respondents had injected with a needle and syringe used by someone they knew was infected with hepatitis C. Of these people, 76% (n = 71) reported that they were infected with hepatitis C, although it is not known whether this diagnosis was made before or after they had shared equipment with someone they knew was infected. Further, another 4% (n = 14) of respondents had knowingly shared needles/

syringes with an HIV positive user. One reason given was that it is sometimes inconvenient for them to collect new fits (Table 5). Moreover, it is not possible for them to use a new fit every hit because needle and syringe programs can not presently meet this demand due to having restricted hours of access and their being too few exchanges. It is important to note that in our sample, 63% of respondents, who had knowingly shared with a hepatitis C positive person, reported that a new fit was unavailable at the time of injecting. This leads to the conclusion that for this study group it is the unavailability of injecting equipment which provides the greatest opportunity for the transmission of hepatitits C. Many studies in the USA (Rockwell *et al*, 1999), UK (Sharon *et al*, 2000) and elsewhere in Europe (Van Ameijden *et al*, 1994) also report evidence of unavailability of injection equipment at the time of injection and subsequent sharing of needles. Although some needle sharing undoubtedly occurs as a consequence of poor or difficult access to clean injecting equipment, some intravenous drug users continue to share their injection equipment regardless of availability of clean equipment and regardless of the risk they pose to themselves and to others. These might be due to some subjective considerations which have an equal bearing on the situation. It is possible that HCV or HIV-related risks of needle sharing does not always form a prominent part of the drug users' calculations. Drug injectors appear to share understanding of the desire to inject drugs as soon as possible after their possession (Barnard,1993). It would appear that further efforts should be made to inform drug injectors about the risks associated with sharing needles or injecting equipment. In order to change behavior, both information and easy access to the means are essential.

The high incidence of unprotected sex amongst subjects is cause for concern, particularly in view of the fact that more than 80% of the subjects had a long standing unprotected sexual relationship with their partner. The sexual behavior of injecting drug users may be of less concern than sharing of needles/syringes with regard to the spread of HCV; nonetheless the disease may be transmitted sexually. A sero-prevalence study of drug users reports association between sexual behavior and hepatitis C transmission and reveals the fact that injecting drug users had higher anti-HCV prevalence when their clinical history of sexually transmitted disease was taken into account (Thomas *et al*, 1994; Dienstag, 1997). A recent study by Van De Ven *et al* (1999) found that gay and homosexually active men in Australia, attending a nationwide telephone survey, were positive for anti-HCV (2%) where some (9.9%) of these had a history of intravenous drug use. However, it is difficult to be certain in these cases whether the high rate in the partner is due to sexual transmission, or due to other shared behaviors such as shared needles or syringes. Taken in conjunction with the sexual behavior in this study, the risk of HCV transmission amongst this group is clear. Further research would be useful in investigating sexual behavior and hepatitis C transmission.

CONCLUSION

As indicated by this survey of 336 injecting drug users, a large proportion of Sydney drug users engage in HCV risk-taking behavior by their practices of injecting, sharing needles, tattooing and sexual behavior . These findings point to the immediate need for widespread education providing information about hepatitis C targeted not only at the general public but also the injecting drug using population. Although a much higher proportion of the user community has HCV than HIV/AIDS health education for HCV has been much less developed than for HIV/AIDS.

The hepatitis C pandemic in Australia has not received the same attention as the HIV/AIDS problem. This is despite the high morbidity and mortality associated with HCV and its potential to impact significantly on community health. There are some education campaigns aimed at controlling the epidemic, however social issues relevant to controlling the spread of the virus have not been addressed

in the national drug strategy. It is vital that Australian governments turn their attention to the social aspects of intravenous drug use in the same fashion as has been developed in response to HIV/AIDS. Such a response would include similar measures as are used to control the spread of HIV, such as information for users on safe drug use and the provision of clean injecting equipment.

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