Effects of duration of injection drug use and age at first injection on HCV among IDU in Kabul, Afghanistan†

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ABSTRACT

Background Hepatitis C virus (HCV) prevalence is high among injection drug users (IDUs) in Afghanistan. Duration of injection and young age at first injection are common risk factors for HCV in IDU populations. The association of HCV with these time factors was analyzed.

Methods Socio-demographic and drug use behavior information were collected. Participants had rapid testing for HCV with recombinant immunoblot assay confirmation. Modeling of non-linear associations was performed using fractional polynomial logistic regression.

Results Among 459 male IDUs, age at first injection had a constant HCV risk (odds ratio (OR): 1.01 per year; 95% confidence interval (CI): 0.98–1.03), while each additional year of injection drug use had a significantly increased risk (OR: 4.72 per year, 95% CI: 2.92–7.66). HCV risk increased significantly with each additional year of injecting drug use by groups of injectors: young (<20 years, OR: 1.97; 95% CI: 1.27–3.07), middle (23–28 years, OR: 1.76; 95% CI: 1.28–2.43) and older (>29 years, OR: 7.56; 95% CI: 3.15–18.14).

Conclusion The probability of HCV infection increased markedly by duration of injection drug use and varied according to age at first injection. Drug counseling and educational efforts should be directed to older drug users who have not yet initiated injecting and to young IDUs to avert infection and reduce risky drug use behaviors.

Keywords Afghanistan, age, duration, first injection, HCV, IDU, risk

Introduction

Hepatitis C virus (HCV) infection is one of the most prevalent infections among injection drug users (IDUs). HCV is primarily acquired through sharing contaminated needles/syringes or other injecting equipment (e.g. cookers/spoons, cotton). Duration of injection drug use and young age at first injection have been reported as risk factors for HCV infection in multiple settings. However, some, but not all, studies indicate that young age at initiation of injecting is a stronger predictor of HCV infection than duration of injecting, primarily due to the propensity of young IDU to engage in risker injecting practices. There is a need to better determine which time factor is the more important predictor of infection in a given setting to design meaningful prevention programs.

The Central and South Asian region is experiencing a rapid increase in the number of IDUs with maturing epidemics of HCV among this population. In Pakistan

†The opinions and assertions made by the authors do not reflect the official position or opinion of the U.S. Department of the Army or Navy, or of the respective in-country National HIV/AIDS Control Programs or any other organization listed.
and Iran, duration of injecting is positively associated with HCV.\textsuperscript{11,12} However, age at initiation of injection was not specifically assessed in these studies. Based on available data about the context of drug use in Afghanistan, there appears to be a recent shift from smoking to injecting use, mainly among young people.\textsuperscript{14} Thus, young drug users constitute a population of particular interest about which little is known.

In a previous report, HCV prevalence was 37\% among a sample of IDUs in Kabul, Afghanistan.\textsuperscript{15} Duration of injecting, ever sharing needles/syringes, and receiving injections by a non-medical provider were associated with HCV infection, while age of initiating injecting was not. Because drug use behaviors and HCV risk may vary by age of initiation, we studied the relationship of duration of injection on HCV infection by this time marker. Data from this analysis may improve the efficacy of targeted prevention strategies and efforts to reduce the initiation into injection drug use and HCV transmission among IDU in Kabul.

**Methods**

**Study population**

A cross-sectional study was conducted among IDUs in Kabul, Afghanistan to assess the prevalence of HIV, syphilis, hepatitis B virus and HCV. Details of the enrollment process, laboratory analysis and preliminary results of infections have been previously described.\textsuperscript{15} Briefly, adult participants 18 years or older were recruited during the period June 2005 to June 2006 by outreach workers known to them, and those IDUs interested in study participation were brought to the Voluntary Counseling and Testing (VCT) Center at the Central Polyclinic, an Afghanistan Ministry of Public Health facility. At the VCT, IDUs who reported injection drug use in the last 6 months (confirmed through physical examination) were invited to participate in the study. After obtaining written informed consent, all participants completed an interviewer-administered questionnaire detailing demographics and risk behaviors and received whole blood rapid testing for HIV antibody, syphilis antibody, hepatitis B surface antigen (HBsAg) and hepatitis C antibody (HCV Ab).

**Laboratory methods**

Initial HCV Ab testing was performed with Standard Diagnostics HCV rapid test (Standard Diagnostics Laboratories, Seoul, Korea), with confirmation by the Chiron RIBA\textsuperscript{26} HCV 3.0 SIA immunoblot assay (Chiron Corporation, Emeryville, CA, USA). Confirmatory testing was performed by trained staff at the VCT Center in Kabul.

**Statistical analysis**

Duration of injection drug use was calculated by subtracting reported age at first injection use from age at interview. For analysis, eligible participants were men who had injected for 20 years or less (459 of 463 participants). Participants were classified into groups of injectors based on the tertiles of age at first injection drug use (younger: \( \leq 22 \) years, middle: 23–28 and older: \( \geq 29 \) years). Univariate and multivariable risk factor analyses were performed by using logistic regression. All significant variables found in univariate analysis were entered into a multivariable forward approach to identify independent risk factors associated with HCV. Effect of duration of injecting, a continuous risk variable on HCV infection between groups of injectors, was assessed using fractional polynomial logistic regression.\textsuperscript{16} This regression-based approach was chosen to avoid the selection of cut points and to retain the continuous scale of the observations. This approach is useful in non-linear regression analysis by fitting a second-order fractional polynomial to the data. The best power transformation was chosen from \(-2, -1, -0.5, 0, +0.5, +1, +2, +3\). The test is performed by comparing the difference in model deviances with a chi-square distribution on 1 degree of freedom. Chi-square or Fisher’s exact test were used to compare the differences for categorical variables, and Student \( t \)-test or Mann–Whitney \( U \)-test for continuous variables.

**Results**

Among 459 male participants included in this analysis, 84.6\% had changed from smoking or ‘chasing’ (burning opium on foil or other surface and inhaling smoke) opiates to injecting, while 15.4\% had initiated opiate use via injection. Syringe cleaning was practiced at any previous time by 58.4\% (\( n = 270 \)) of participants, of whom only 21 used bleach to clean syringes. About one-fifth (18.1\%, \( n = 83 \)) stated they only used syringes once followed by disposal.

HCV prevalence was not significantly different between the three groups (younger, middle and older) of injectors (Table 1). Mean duration of injection drug use was 4.8, 4.0 and 3.7 years (\( P = 0.020 \)) and mean age at first injection was 19.5, 25.2 and 35.0 years (\( P < 0.001 \)) for the younger, middle and older injectors, respectively. Hashish (31–36\%), followed by heroin (18–28\%), were reported as the first drug used by the three groups (\( P = 0.013 \)).

Univariate risk factor analysis showed that only ever-sharing needles was significantly associated with HCV infection among all three groups of injectors, while aspirating...
and re-injecting blood and unemployment were found among younger injectors (Table 2). In a multivariate logistic analysis with forward selection, ever-sharing needles (adjusted odds ratio [AOR] 7.8, 95% CI: 3.6–16.8) and unemployment (AOR: 2.8, 95% CI: 1.1–7.3) were found to be independent risk factors for HCV among younger injectors. Among older injectors, heroin use (AOR: 3.0, 95% CI: 1.0–8.7) and ever-sharing needles (AOR: 3.4, 95% CI: 1.7–7.0) were independently associated with HCV infection.

Fractional polynomial analysis reported that for each year of injection drug use, a significant increased risk for HCV infection was evident (OR: 4.72, 95% CI: 2.92–7.66) whereas age at first injection drug use as a continuous factor was not associated with infection (OR: 1.01, 95% CI: 0.98–1.03). The association between longer durations of injecting with an elevated odd of HCV infection persisted (OR: 4.45, 95% CI: 2.55–7.78) after controlling for potential confounders such as ever-sharing needles/syringes, ever aspirating and re-injecting blood, reported ease of obtaining new sterile needles, ever-using heroin, lack of knowledge of hepatitis and frequency of injections per day.

Among all groups of injectors, the probability of HCV infection continued to increase similarly, from 0.20 to 0.40 on average during the first 5 years of drug injection use. However, a marked increase in the probability of HCV infection was observed among older injectors with respect

<table>
<thead>
<tr>
<th>Feature</th>
<th>Total subjects (n = 459)</th>
<th>&lt;22 years (n = 153)</th>
<th>23–28 years (n = 159)</th>
<th>&gt;29 years (n = 147)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years) [mean (SD)]</td>
<td>30.4 (7.7)</td>
<td>24.2 (3.8)</td>
<td>28.8 (3.8)</td>
<td>38.6 (6.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age, first injection (years) [mean (SD)]</td>
<td>26.4 (7.3)</td>
<td>19.5 (2.1)</td>
<td>25.2 (1.6)</td>
<td>35.0 (5.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Duration injection use (years) [mean (SD)]</td>
<td>4.2 (3.6)</td>
<td>4.8 (4.0)</td>
<td>4.0 (3.5)</td>
<td>3.7 (3.1)</td>
<td>0.020</td>
</tr>
<tr>
<td>Low education (&lt;6 years [n %])</td>
<td>251 (55)</td>
<td>82 (54)</td>
<td>84 (53)</td>
<td>85 (58)</td>
<td>0.645</td>
</tr>
<tr>
<td>Single marital status [n %]</td>
<td>202 (44)</td>
<td>98 (65)</td>
<td>77 (48)</td>
<td>27 (18)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Monthly income &lt;3500 Afs [n %]a</td>
<td>241 (53)</td>
<td>74 (48)</td>
<td>84 (53)</td>
<td>83 (57)</td>
<td>0.371</td>
</tr>
<tr>
<td>First type of drug use [n %]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hashishb</td>
<td>152 (33)</td>
<td>48 (31)</td>
<td>51 (32)</td>
<td>53 (36)</td>
<td>0.013</td>
</tr>
<tr>
<td>Opium</td>
<td>74 (16)</td>
<td>32 (21)</td>
<td>26 (16)</td>
<td>16 (11)</td>
<td>0.626</td>
</tr>
<tr>
<td>Heroin</td>
<td>101 (22)</td>
<td>43 (28)</td>
<td>28 (18)</td>
<td>30 (20)</td>
<td>0.020</td>
</tr>
<tr>
<td>Other</td>
<td>132 (29)</td>
<td>43 (28)</td>
<td>28 (18)</td>
<td>30 (20)</td>
<td>0.020</td>
</tr>
<tr>
<td>Ever shared needles</td>
<td>164 (36)</td>
<td>51 (33)</td>
<td>53 (33)</td>
<td>60 (41)</td>
<td>0.296</td>
</tr>
<tr>
<td>Aspirate and re-inject blood</td>
<td>382 (83)</td>
<td>122 (80)</td>
<td>134 (84)</td>
<td>127 (86)</td>
<td>0.300</td>
</tr>
<tr>
<td>Easy to get new syringes</td>
<td>200 (44)</td>
<td>62 (51)</td>
<td>72 (46)</td>
<td>66 (45)</td>
<td>0.626</td>
</tr>
<tr>
<td>Heroin use</td>
<td>375 (82)</td>
<td>126 (82)</td>
<td>130 (81)</td>
<td>119 (81)</td>
<td>0.909</td>
</tr>
<tr>
<td>Aware of hepatitis</td>
<td>411 (96)</td>
<td>138 (98)</td>
<td>141 (95)</td>
<td>132 (96)</td>
<td>0.459</td>
</tr>
<tr>
<td>HCV antibody-positive status</td>
<td>169 (37)</td>
<td>55 (36)</td>
<td>59 (37)</td>
<td>55 (37)</td>
<td>0.962</td>
</tr>
</tbody>
</table>

SD, standard deviation.

a 3500 Afs (Afghani, currency of Afghanistan) = ~US$ 70.
b Hashish is a preparation of cannabis typically smoked.

*A P-value <0.05 indicates whether there is a statistically significant difference across the three age groups of injecting drug users.

Statistically significant variables (P-value <0.05) are shown in boldface.

Participants were classified into three groups of injectors based on the tertiles of age at first injection drug use.

<table>
<thead>
<tr>
<th>Feature</th>
<th>&lt;22 years, OR (95% CI)</th>
<th>23–28 years, OR (95% CI)</th>
<th>&gt;29 years, OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single marital status</td>
<td>1.1 (0.5–2.1)</td>
<td>1.8 (0.8–3.0)</td>
<td><strong>2.5 (1.1–5.8)</strong></td>
</tr>
<tr>
<td>Low education (&lt;6 years)</td>
<td>1.0 (0.5–2.0)</td>
<td>1.2 (0.6–2.3)</td>
<td>1.1 (0.6–2.3)</td>
</tr>
<tr>
<td>Unemployment</td>
<td><strong>2.4 (1.1–5.9)</strong></td>
<td>1.0 (0.3–2.9)</td>
<td>1.8 (0.6–5.4)</td>
</tr>
<tr>
<td>Ever shared needles</td>
<td><strong>6.8 (3.3–14.4)</strong></td>
<td><strong>5.0 (2.4–10.1)</strong></td>
<td><strong>3.6 (1.8–7.3)</strong></td>
</tr>
<tr>
<td>Aspirate and re-inject blood</td>
<td><strong>2.9 (1.1–7.5)</strong></td>
<td>1.2 (0.5–2.9)</td>
<td>1.5 (0.5–4.1)</td>
</tr>
<tr>
<td>Easy to get new syringes</td>
<td>1.8 (0.9–3.5)</td>
<td>1.3 (0.7–2.5)</td>
<td>1.0 (0.5–2.0)</td>
</tr>
<tr>
<td>Heroin use</td>
<td>0.9 (0.4–2.3)</td>
<td>1.3 (0.5–3.1)</td>
<td><strong>3.3 (1.2–9.4)</strong></td>
</tr>
<tr>
<td>Aware of hepatitis</td>
<td>1.1 (0.1–12.2)</td>
<td>0.5 (0.03–1.1)</td>
<td>1.1 (0.2–6.5)</td>
</tr>
</tbody>
</table>
to duration of injection use (Fig. 1). The odds ratio of HCV infection for each additional year of injecting drug use was 1.97 (95% CI: 1.27–3.07) for younger injectors, 1.76 (95% CI: 1.28–2.43) for middle injectors and 7.56 (95% CI: 3.15–18.14) for older injectors. These associations and the shape of the curves remained similar after controlling for potential confounders (data not shown).

**Discussion**

Our findings suggest that the probability of HCV transmission between the three groups of injectors increased with duration of injecting use and varied according to age of injection initiation in this IDU population.

A greater propensity to engage in high-risk injection practices has been reported among young injectors in Rio de Janeiro, Brazil, Sydney, Australia and Vancouver, Canada. In our analysis, the association between HCV and the high-risk practice of sharing needles was strongest in the youngest injecting group. Unemployment, a situational factor, was also associated with HCV, which along with other social factors such as poverty and poor education are linked to initiation of injecting. The country's unemployment and literacy rate is estimated to be around 40 and 28%, respectively.

We found that older injectors had a shorter duration of injecting compared with younger injectors (3.7 years vs. 4.7 years). This suggests that older injectors were more likely to acquire HCV infection over a shorter time period. This factor has been also observed among IDUs in England and Wales. In our study population, heroin use and needle sharing were two independent risk factors associated with HCV among older injectors. These associations may reflect injecting networks composed of age-equivalent peers, with higher circulating prevalence of HCV within the social network in Kabul. Further, heroin use may be introduced by more experienced injectors within a network as the drug of choice. Sharing is likely common within these networks and 'cleaned' syringes may have unwittingly transmitted HCV, as bleach was used as a cleaning agent by only 7.8% of the 260 participants reporting any syringe cleaning. Syringes were available for purchase at pharmacies for a relatively nominal price at the time of this study. However, IDU participants of subsequent studies have relayed that pharmacy owners are reluctant to sell equipment or have raised the price and that current needle and syringe programs do not provide either sufficient numbers or convenient times for collection and distribution to meet daily needs for safe injecting.

Our findings suggest the need to implement counseling and education efforts to prevent initiation of injection drug use through effective primary prevention programs. Such programs should emphasize the importance of reducing risky injection practices beyond needle sharing, such as sharing injecting equipment, to avert HCV and other blood-borne infections among new older injectors in Kabul. These programs should also perform street-based interventions to recruit IDU currently not accessing treatment programs. Early and consistent interventions are essential to prevent widespread acquisition, particularly in light of estimates of increasing injecting use. At the time of this study, a national survey noted increases in both drug use and drug injection with most injecting and heroin use confined to urban centers. Unsafe injecting practices were documented in Kabul city in a 2003 evaluation and appear to have persisted. This study also noted that young people were reportedly initiating heroin use.

Our analysis has some limitations. Some behaviors, such as ever-sharing needles, may have been under-reported due to social desirability. Due to the low literacy rates in this population, interviewer-administered surveys were
performed. We tried to mitigate this effect by having private interviews with interviewers of the same sex. This study used a convenience sampling approach because access and size of the target population is difficult and unknown in Kabul; therefore, findings cannot be generalized to the whole IDU population. Our participants were predominantly either IDUs known to harm reduction program, outreach workers or members of their injecting networks. IDUs in harm reduction programs have higher risk behaviors and to be at greater risk for blood-borne infection transmission in some settings, which, if true in Kabul, may artificially increase the HCV risk.\textsuperscript{25–27} However, the recommendations derived from this data will be used to inform programming, having a large proportion of IDUs willing to use harm reduction programs in the sample may ensure that changes are tailored to the needs of program recipients. A 2-year prospective evaluation of harm reduction program participation and counseling and testing compared with counseling and testing alone among IDUs in Kabul has recently completed and is anticipated to provide information on program efficacy.

In summary, analysis of duration of injection drug use along with at first injection drug use allowed a better understanding of how these time factors are related to HCV epidemiology in this IDU population. The rapid changes in the political and social situation, continued poverty and instability and a ready supply of opiates in Afghanistan have created an environment conducive to new and continued problem drug use, reflected by recent findings.\textsuperscript{14} This data suggest that interventions targeted to injecting drug users in Kabul need to be modified based on duration of injection and age at first injection, with a more intensive focus on prevention and reduction of high-risk injecting behaviors among younger injectors and an emphasis on older drug users who have not yet initiated injecting. Ongoing monitoring and evaluation of preventive programming for drug users is needed to ensure that programmatic changes remain relevant and effective in this challenging environment.

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