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Risky behavior and correlates of HIV and Hepatitis C Virus infection among people who inject drugs in three cities in Afghanistan

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ABSTRACT

Background: Injecting drug use is the primary mode of HIV transmission and acquisition in Afghanistan. People who inject drugs (PWID) in the country have been characterized by high risk injecting behavior and a high burden of HCV infection. We aimed to estimate the burden of HIV, HCV, and other infectious diseases and to identify the correlates of HIV and HCV infection among PWID living in three major Afghan cities in 2009.
Methods: Epidemiologic data was collected among PWID for the integrated biological and behavioral surveillance (IBBS) survey between May and August, 2009 in three Afghan cities. Data were collected using a structured questionnaire and biologic specimens to screen for HIV, HBV, HCV, syphilis, and HSV-2 using rapid testing kits. Multiple logistic regression models were constructed to identify correlates of infection.
Results: Among 548 participants, pooled HIV prevalence was 7.1% (Mazar-i-Sharif: 1.0%, Kabul: 3.1%, Herat: 18.4%) and HCV prevalence was 40.3%. Almost all participants with HIV infection were co-infected with HCV (94.9%). Pooled prevalence estimates for other diseases included 7.1% for HBV, 5.5% for syphilis; and 9.3% for HSV-2. Living in Herat, ever in prison and time injecting were independently associated with HIV infection. Living in Kabul, Herat and time injecting were independently associated with HCV infection.
Conclusions: There is a high and heterogeneous burden of HIV and HCV among PWID in Afghan cities. Provision of comprehensive harm reduction services to PWID in Afghanistan is warranted to reduce exposures associated with HIV and HCV infection, especially in the city of Herat.

1. INTRODUCTION

Worldwide, an estimated 30% of all new HIV infections outside of sub-Saharan Africa are related to injecting drug use (Harm Reduction International, 2012). People who inject drugs (PWID) are at increased risk of acquiring HIV and hepatitis C Virus (HCV) infection due to individual high risk injecting behaviors, such as use of non-sterile needles, syringes, and other paraphernalia (Strathdee et al., 2010); frequent injections, and sexual exposures (Beyrer et al., 2005). Structural factors, such as criminalization of injection drug use, and harmful government policies, may impact and enhance harmful injection practices by creating situations in which safe injection practices may be rushed to keep injection drug use hidden and avoid police (Strathdee et al., 2010). Other diseases that share similar modes of transmission with HIV, including syphilis and hepatitis B virus (HBV) also confer a significant burden of morbidity on PWID in Afghanistan (Todd et al., 2007, 2010).

Afghanistan accounts for 74% of the world's opium production, standing as the lead global cultivator and producer (United Nations Office on Drug and Crime; UNODC, 2013). In addition, the number

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of PWID has increased in the country between the years 2008 and 2011 (UNODC, 2013). Poor socioeconomic conditions coupled with high opium production, international policies against drug trafficking and expanding trafficking routes are factors that may have facilitated a surge in heroin consumption and a transition from smoking to injecting, which is a more cost-effective and a faster method of drug delivery (Beyrer et al., 2010a,b; Todd et al., 2012). Between 2006 and 2011, Afghanistan was one of only five countries to have increased prevalence of injecting drug use (Beyrer et al., 2010a,b). Within the Afghan context, these factors create opportunities for expansion of the HIV and HCV epidemics.

Previous research in Afghanistan, which used convenience sampling methods, estimated the HIV prevalence in the range of 0–3.5% among PWID in urban centers, including Kabul, Herat, Mazar-i-Sharif, and Jalalabad between 2005 and 2008 (Todd et al., 2007; Nasir et al., 2011). The prevalence of other infectious diseases, however, has been higher, with HCV prevalence estimates ranging from 12.5% to 49.1% in Jalalabad and Herat, respectively. Likewise, the prevalence of HBV has been estimated at 3.5% and 10.4% in Herat and Jalalabad, respectively (Nasir et al., 2011). Todd et al. reported that needle sharing, receiving injections from a non-medical provider, and injecting drugs for more than three years were independently associated with an increased risk of HCV infection (Todd et al., 2007). Nasir et al. (2011) identified several factors that were independently associated with HCV infection in three Afghan cities. These included HIV co-infection, prior addiction treatment, ever aspirating or re-injecting blood, prior incarceration, and sharing injecting equipment in the last six months.

In 2009, Johns Hopkins University (JHU) implemented the integrated biological and behavioral surveillance (IBBS) survey in Kabul, Herat and Mazar-i-Sharif. The IBBS was a collaboration with the Afghan National AIDS Control Program (NACP) and was conducted with the intent of improving national statistics and monitoring of HIV, HCV, and other STIs among key populations, including PWID, men who have sex with men, prisoners, and female sex workers (FSW). Results were projected to inform national response to these epidemics.

The objectives of this analysis were to estimate the burden of HIV, HCV, and other infectious disease and to identify the correlates of HIV and HCV infection among PWID living in three major urban centers in Afghanistan in 2009.

2. Methods

2.1. Sites and participants

The IBBS was implemented in three urban centers, Kabul, Herat, and Mazar-i-Sharif in 2009. Kabul is the capital of Afghanistan with a growing population of over three million people. Herat, located in the North-West, close to the border with Iran, has a population of over 400,000. Mazar-i-Sharif, located in the North, is geographically close to the border with Uzbekistan. Mazar-i-Sharif is the capital of Balkh Province, with a population of over 350,000 (Central Statistics Organization, 2014). Mazar-i-Sharif and Herat, in particular, are important border crossing points characterized by significant population movement. These cities were selected based on previous information regarding substance use, security, and the requirements of the NACP.

IBBS study sites were centrally located within cities. Caution was taken to avoid locating any of the study sites too close to any harm reduction center (e.g., Nejat Center or Medecins du Monde Clinic) to reduce potential biased sampling or over-sampling of harm reduction clients. Sites were exclusively used for purposes of the IBBS. Survey sites were open six days per week between the hours of 8 am to 2 pm, normal work hours in Afghanistan.

Participants were recruited between May and August 2009 using respondent driven sampling (RDS) methods. This is a peer-based method that is commonly used to sample hidden populations (Malekinejad et al., 2008; Magnani et al., 2005). The seeds, individuals from the PWID population who initiate the recruitment chains, were purposively selected during the formative phase to represent the range of diversity of the population, including selection on the basis of different ages, ethnicities, and time injecting. Three recruitment coupons were distributed to seeds and participants who completed the study activities (questionnaire and biological testing) to recruit peers from the PWID population. The target sample size was 278 participants per site and was calculated using a design effect of two, to account for the RDS sampling method, and were based on the proportion of PWID reported to share needles in Kabul and Mazar-i-Sharif in 2006 and 2007. The full description of sample size calculations have been reported elsewhere (JHU, 2010).

In Afghanistan, it is culturally inappropriate for adult women and men to interact publically. Budgetary constraints limited the project's ability to hire and train a separate team of female interviewers to engage female participants. Consequently, the JHU research team was unable to recruit female PWID seeds during the formative work or interview women during the IBBS survey. Thus, no data was collected from female PWID.

Recruited individuals who arrived at the interview site were screened for eligibility using the following inclusion criteria: aged 18 years or older, born in Afghanistan, reported injection drug use in the past three months, and reported being a current resident of the city where the IBBS was implemented. Those who were eligible for the study then underwent the verbal informed consent process. Verbal consent was used as an added precaution to protect the anonymity of participants given the potential legal repercussions for those who inject drugs. All participants were also given the option to take a paper copy of the consent. Participants were informed that they were allowed to withdraw from the IBBS at any time and were provided with contact information to allow them to call the IBBS staff for any questions to return to the study at another time. A separate verbal informed consent process for blood testing was conducted later and prior to rapid screening. Participants were allowed to participate in the questionnaire component of the study, even if consent for rapid testing was not provided.

2.2. Study activities

IBBS activities consisted of two components: (1) a structured, interviewer administered questionnaire, and (2) biologic testing. The questionnaire captured sociodemographic characteristics, sexual behaviors (including sex with other men and with FSW); HIV knowledge, based on UNGASS indicator 14 for key populations (UNAIDS, 2012), substance use behaviors, including types of substances used, history of needle sharing, duration injecting drugs, history of imprisonment, and access to harm reduction services. Harm reduction services were defined as services provided to PWID at clinics or by outreach workers. These services included distribution of clean needles and syringes, condoms, HIV counseling and testing. Trained, local interviewers administered the structured questionnaire in Dari, the language spoken by over 90% of the urban populations in Afghanistan (The Asia Foundation, 2013). The questionnaire was administered in a private location within the research site.

Blood specimens were collected for rapid screening for HIV, HCV, HBV, syphilis, and HSV-2 infection. HIV rapid screening used Standard Diagnostics Bioline HIV-1/2 3.0 IgG and IgM (Standard Diagnostics (SD), South Korea). Participants with a positive rapid screen result were referred for confirmatory testing in accordance with standard HIV testing guidelines for Afghanistan (MoPH, 2008). Standard Diagnostics Bioline HCV 3.0 (SD, South Korea) was used for qualitative detection of antibodies against HCV. HBV infection was detected with Standard Diagnostics HBsAg 3.0 (SD, South Korea). The rapid test for syphilis infection employed Standard Diagnostics Bioline syphilis 3.0 IgG, IgM and IgA antibodies against *T. pallidum* (SD, South Korea) and rapid testing for HSV-2 included the Standard Diagnostics HerpeSelect Express for IgG antibodies for HSV-2 (SD, South Korea). Pre- and post-test counseling was provided to all participants during specimen collection and referrals were provided for confirmatory testing and treatment. Biologic testing was conducted by certified laboratory personnel hired by NACP. For laboratory quality control purposes, every fifth positive HIV specimen and every 15th HIV specimen, regardless of the result, was collected and submitted for testing in an accredited independent laboratory for confirmation with ELISA.

Participants who completed the behavioral questionnaire and the full biologic screening procedures received the equivalent to $1 USD as an incentive. Each participant could then receive an additional $1 USD for each recruited peer that completed the interview and the blood testing. Participants were allowed to recruit up to three peer participants.

2.3. Data analysis

Distributions of behavioral and biologic variables of interest were calculated for each site and for a pooled total. Crude estimates are presented in the tables; statistical analysis did not employ the use of RDS weights due mainly to coupon log mismanagement at the sites, which resulted in missing coupon data that is necessary for calculating these weights. Chi-square test and Fisher's exact test were used to assess group differences for binary outcomes during descriptive analysis. Statistical significance was set at $p < 0.05$. HIV and HCV screening results were the outcomes of interest for regression modeling. Simple and multiple logistic regression models (MLR) were constructed to estimate the odds ratio (OR), adjusted OR (AOR) and 95% confidence interval (95% CI). Variables were tested for collinearity using variance inflation factor. Models for MLR were constructed on the basis of statistical significance ($p < 0.05$) of the association between outcome and variable using simple logistic regressions (SLR), and were added to the model using the forward stepwise selection method. Some variables, including history of needle sharing (ever), history of being in prison (ever) and living abroad in the past 10 years, were included into the model due to prior knowledge of their association with the outcomes of interest

(Todd et al., 2007; Nasir et al., 2010, 2011). Akaike's Information Criteria, Bayesian Information Criteria, and Likelihood Ratio Test were used to select the final MLR model for each outcome. The final multivariate model included city of residence, lived abroad in the past 10 years, lifetime history of marriage, lifetime history of prison, duration of injecting drug use, ever sharing needles, HCV and HIV. Data were analyzed using STATA 12 (STATA Corp, College Park, TX).

2.4. Ethics statement

The 2009 IBBS was originally approved as public health practice by JHU Institutional Review Board (IRB) and by the Afghan Ministry of Public Health. Secondary data analysis for this manuscript was approved by JHU IRB. The IBBS adhered to JHU guidelines for human subjects' research. Additional measures to protect the participants' identity included the use of verbal informed consent and refrained from collecting personal identifiers. All data were password protected and securely stored within a locked container at JHU office in Kabul, Afghanistan.

3. Results

3.1. Sample characteristics

A total of 548 PWID were enrolled into the study: 52.2% ($n = 286$) from Kabul, 29.2% ($n = 160$) from Herat, and 18.6% ($n = 102$) from Mazar-i-Sharif. All participants were male, with a median age of 28 years (SD = 7.05) and most were of Hazara ethnicity. All participants provided biologic specimens. Slightly more than half of the total sample had never been married. Almost half of the participants were unable to read or write. Most participants reported a monthly income ranging from 3000 to 6999 AFS (Table 1).

3.2. Behavior

Among participants, the most commonly used drug was heroin, with polysubstance abuse being highly prevalent. Thirty-eight percent of the sample reported injecting drugs for less than one year. Overall, 6.4% ($n = 35$) of participants reported sharing a needle at last injection and 30.1% ($n = 150$) reported a lifetime history of distributive or receptive needle sharing. Lifetime history of having sex with another male and ever having sex with a female sex worker were reported. Less than half of the total sample reported ever using a condom with any partner. Unsafe injecting practices, including sharing a used needle and duration of injecting were significantly higher in Herat when compared to other sites. Over 60% of the sample reported ever receiving harm reduction services (Table 2).

3.3. Biologic testing

HIV prevalence among the total sample was 7.1%, ($n = 39$). HIV prevalence was significantly higher among participants from Herat ($p < 0.001$), compared to Kabul and Mazar-i-Sharif. Across cities, the prevalence of HCV was 40.3% ($n = 221$). HCV prevalence was higher in Herat when compared to Kabul and Mazar-i-Sharif ($p < 0.001$). The overall prevalence of HIV/HCV co-infection was 6.8% ($n = 37$) out of the total number of PWID sampled. Prevalence of HIV/HCV co-infection was highest in Herat. HBV prevalence was similar across all sites. Syphilis and HSV-2 were most prevalent among participants in Mazar-i-Sharif (Table 2).

3.4. Associations with HIV and HCV infection

Bivariate and adjusted analysis for correlates of HIV and HCV infection in the three cities are presented in Table 3. After adjustment in multivariate analysis, participants living in Herat were more likely to screen positive for HIV when compared to those surveyed in Mazar-i-Sharif. Injecting drugs for more than three years, lifetime history of imprisonment, and HCV infection were independently associated with HIV infection (Table 3).

After adjustment, PWID living in Kabul and Herat were more likely to screen positive for HCV compared to those living in Mazar-i-Sharif. Duration of time injecting was independently associated with HCV, including 1–3 years of injecting drug use, and injecting for more than 3 years. Any history of marriage was independently associated with a lower risk of HCV infection. Finally, screening positive for HIV was associated with almost 15-fold increased odds of screening positive for HCV (Table 3).

Given the exceptionally high prevalence of HIV and HCV in Herat, separate multivariate analyses were conducted to determine the correlates of infection in this city (see Supplementary Material). Only HCV infection remained independently associated with HIV infection, but with extremely wide confidence intervals (AOR: 21.4; 95%CI: 2.4–191.5). Independent correlates of HCV infection included HIV infection and injecting for more than 3 years.

4. Discussion

This analysis describes high-risk injecting behaviors and prevalence of HIV, HCV, HBV, syphilis, and HSV-2 among PWID in Afghanistan. Particularly notable is the high prevalence of HIV, HCV, and HIV/HCV co-infection among PWID in Herat. In addition to higher risky injecting behavior practices among PWID in this city (use of sterile needle during their last injection, needle sharing during their last injection and time injecting drugs) when compared to PWID living in Kabul and Mazar-i-Sharif, thus increasing their risk of HIV and HCV infection. Duration of injection was independently associated with HIV and HCV infection, suggesting the cumulative effect of injecting practices on disease outcomes among PWID in Afghanistan. Finally, with the exception of time injecting drugs between 1 and 3 years, correlates of infection for HIV and HCV infection in the city of Herat were similar to those presented in Table 3 (data not shown)

HIV prevalence patterns were markedly different across the study cities. The odds of infection were 15 times higher in the city of Herat when compared to Mazar-i-Sharif. However, HIV and HCV prevalence estimates from Kabul were similar to those estimates reported by Todd et al. in a study conducted in 2005 among PWID in the same city (HIV = 3.0% and HCV = 36.6%) (Todd et al., 2007) and among PWID living in Kabul between 2007 and 2009, with an HIV prevalence of 2.1% and antibodies to HCV estimated at a prevalence of 36.1% (Todd et al., 2011). Similar findings were reported by Nasir et al. (2011) between 2006 and 2008 among PWID with respect to HCV prevalence among PWID in Herat (49.1%) and both HIV and HCV in Mazar-i-Sharif (0% and 24.1%, respectively). However, HIV prevalence estimates were much higher in the 2009 IBBS (JHU, 2010) compared to those reported by Nasir et al. (2011) in Herat between 2006 and 2008 (18.4% vs. 3.2%, respectively).

With the exception of Herat, the consistency of these estimates may reflect a relative stability of the HIV and HCV epidemic among PWID in these cities, though more data would be necessary for a valid inference. A plausible explanation may be related to forced repatriation of Afghans between 2007 and 2008 from Iran, especially those held in prisons (Joyce, 2007), high regional mobility (IOM, 2014), and existence of drug trafficking routes in Herat (UNODC, 2007), which could partially explain the higher prevalence of risky injecting practices observed in this city when compared to Kabul and Mazar-i-Sharif. Also, the increased HIV estimates found in Herat, compared to earlier estimates provided by Nasir et al. (2011), could also be partially explained by disparate sampling methods (RDS vs. convenience sampling). RDS sampling is known for its ability to reach very hidden populations (Malekinejad et al., 2008; Magnani et al., 2005), and compared to past convenience recruitment from harm reduction centers, may have reached

Table 1
Sociodemographic characteristics among PWID (N = 548) in three cities in Afghanistan, 2009.

Characteristic	Kabul N = 286 n (%)	Herat N = 160 n (%)	Mazar-i-Sharif N = 102 n (%)	Total N = 548 n (%)	p value
Age					
18–24	75 (26.2)	47 (29.4)	22 (21.5)	144 (26.3)	0.07
25–29	103 (36.0)	52 (33.5)	26 (25.5)	181 (33.0)	
30–34	44 (15.4)	33 (21.0)	22 (21.6)	99 (18.1)	
35+	64 (22.4)	28 (17.5)	32 (31.4)	124 (22.6)	
Ethnicity					<0.001
Tajik	103 (36.0)	48 (30.0)	29 (28.4)	180 (32.9)	
Pashtun	46 (16.1)	22 (13.8)	6 (5.9)	74 (13.5)	
Hazara	133 (46.5)	75 (46.9)	42 (41.2)	250 (45.6)	
Uzbek	3 (1.1)	2 (1.3)	5 (4.9)	10 (1.8)	
Other	1 (0.4)	13 (8.1)	20 (19.6)	34 (6.2)	
Lived outside Afghanistan in the past 10 years					
Yes	256 (53.1)	144 (29.9)	82 (17.0)	482 (88.0)	0.03
Marital status					<0.05
Never married	153 (53.5)	86 (53.8)	45 (44.1)	284 (51.8)	
Currently married	87 (30.4)	69 (43.1)	35 (34.3)	191 (34.9)	
Divorced	3 (1.1)	3 (1.9)	3 (2.9)	9 (1.6)	
Separated	37 (12.9)	1 (0.6)	16 (16.7)	54 (9.9)	
Widowed	6 (2.1)	1 (0.6)	3 (2.9)	10 (1.8)	
Literacy					0.78
Unable to read or write	118 (41.4)	60 (37)	40 (39.6)	218 (40.1)	
Monthly income (AFS)*					<0.001
<3000	70 (24.5)	54 (33.8)	43 (42)	167 (30.5)	
3000–6999	164 (57.3)	93 (58.1)	50 (49)	307 (56.0)	
>7000	52 (18.2)	13 (8.1)	9 (9)	74 (13.5)	

* Exchange rate = 1USD = 50 AFS.
** Percent (%) might not add to 100% due to rounding.

Table 2
Distribution of substance use and sexual behaviors, and infectious disease among PWID (N = 548) living in three cities in Afghanistan, 2009.

Characteristic	Kabul N = 286 n (%)	Herat N = 160 n (%)	Mazar-i-Sharif N = 102 n (%)	Total N = 548 n (%)	p value
Substance used[t]...					
Opium	207 (72.4)	142 (88.8)	23 (22.6)	372 (67.9)	<0.001
Hashish	186 (65.0)	121 (75.6)	17 (16.7)	324 (59.1)	<0.001
Heroin*	286 (100)	132 (82.5)	102 (100)	520 (94.9)	NA
Crystal	108 (37.8)	151 (94.4)	5 (4.9)	264 (48.2)	<0.001
Pharmaceutical drugs	87 (30.5)	55 (34.9)	0 (0)	142 (25.9)	<0.001
Alcohol	175 (61.2)	81 (50.6)	12 (11.8)	268 (48.9)	<0.001
Country where first injected					
Afghanistan	242 (84.6)	92 (57.5)	75 (73.5)	409 (74.6)	<0.001
Outside Afghanistan	44 (15.4)	68 (42.5)	27 (26.5)	139 (25.4)	
Use sterile needle at last injection	279 (97.6)	137 (85.6)	99 (97.1)	515 (94.0)	<0.001
Shared a used needle at last injection	6 (2.1)	20 (12.5)	9 (8.8)	35 (6.4)	<0.001
Ever shared a needle [t b]	96 (33.6)	43 (39.5)	11 (10.8)	150 (30.1)	<0.001
Time injecting drugs					
<1 yr	122 (42.6)	51 (31.9)	38 (37.3)	211 (38.5)	0.22
1–3 yr	109 (38.1)	68 (42.5)	40 (39.2)	217 (39.6)	
≥3 yrs	55 (19.2)	41 (25.6)	24 (23.5)	120 (21.9)	
Sexual behaviors					
Sex with another male[t]	57 (28.1)	23 (19.0)	11 (17.1)	91 (23.5)	0.07
Sex with female sex worker[t]	134 (66.0)	67 (55.4)	26 (40.6)	227 (58.5)	0.006
Condom use[t]	119 (42.1)	63 (44.7)	37 (48.1)	219 (43.3)	0.82
HIV knowledge and prevention					
Correct HIV knowledge***	82 (28.7)	70 (43.8)	4 (3.9)	156 (28.5)	<0.001
Received harm reduction services[t]	200 (69.9)	83 (51.9)	59 (57.8)	342 (62.4)	<0.001
Infectious disease					
	Kabul N = 286	Herat N = 160	Mazar-i-Sharif N = 102	Total N = 548	
HIV	9 (3.1)	29 (18.4)	1 (1.0)	39 (7.1)	<0.001
Hepatitis C virus	107 (37.4)	88 (55.7)	26 (25.5)	221 (40.3)	<0.001
HIV/HCV co-infection	9 (3.1)	28 (17.5)	0 (0)	37 (6.8)	<0.001
Hepatitis B virus	20 (7.0)	13 (8.2)	6 (5.9)	39 (7.1)	0.762
Syphilis	10 (3.5)	3 (2)	17 (16.7)	30 (5.5)	<0.001
HSV-2**	24 (8.4)	6 (3.8)	21 (20.6)	51 (9.3)	<0.001

[t] Recall period is lifetime/ever; [b] distributive and/or receptive needle sharing; * 28 PWID in Herat had no information for heroin use; **51 participants (31.9%) in Herat did not provide a response. % Estimated among 497 total PWID and 109 PWID in Herat. 68 had never heard of harm reduction services. *** Based on UNGASS indicator 14 for Most at Risk Populations: Knowledge on HIV Transmission and Prevention. This indicator is commonly used for IBBS. The indicator is constructed based on 5 questions, all of which need to be answered correctly (http://data.unaids.org/pub/manual/2009/jc1676_core_indicators_2009_en.pdf).

Table 3
Bivariate analysis and multivariate analysis of HIV and hepatitis C diagnosis among PWID ($N = 548$) in three Afghan cities, 2009.

Variable	HIV OR (95%CI)	HIV AOR[a] (95%CI)	HCV OR (95%CI)	HCV AOR[a] (95%CI)
City of residence				
Mazar-i-Sharif	Ref	Ref	Ref	Ref
Kabul	3.3 (0.4–26.4)	2.6 (0.3–24.5)	1.8 (1.1–2.9)	**1.8 (1.0–3.2)**
Herat	22.7 (3.0–169.5)	**15.2 (1.5–145.2)**	3.7 (2.1–6.3)	**1.9 (1.0–3.8)**
Lived abroad in the past 10 years				
No	Ref	Ref	Ref	Ref
Yes	5.6(0.8–41.4)	7.1 (0.7–68.6)	1.4(0.8–2.4)	0.9 (0.5–1.7)
Ever been in prison				
No	Ref	Ref	Ref	Ref
Yes	2.2(0.9–78.0)	**9.4 (1.1–78.0)**	**1.9(1.3–2.8)**	1.4 (0.9–2.2)
Duration injecting drugs				
<1 yr	Ref	Ref	Ref	Ref
1–3 yr	7.1 (2.1–24.2)	4.7 (0.9–24.7)	2.8 (1.9–4.3)	**2.3 (1.5–3.7)**
≥3 yrs	10.8 (3.1–37.8)	**7.2 (1.3–39.6)**	6.4 (3.9–10.5)	**5.4(3.0–9.5)**
Ever shared a used needle				
No	Ref	Ref	Ref	Ref
Yes	2.0 (0.9–4.6)	1.1 (0.4–2.8)	1.6 (1.1–2.3)	0.9 (0.6–1.4)
Hepatitis C				
Negative	Ref	Ref	N/A	N/A
Positive	32.4 (7.7–136.0)	**15.7(3.4–72.5)**	N/A	N/A
HIV				
Negative	N/A	N/A	Ref	Ref
Positive	N/A	N/A	32.4 (7.7–135.9)	**14.9(3.2–70.2)**

[a] Models also adjusted for education, marital status, correct HIV knowledge, HBV, HSV-2 and syphilis infection; AOR: Adjusted Odds Ratio; Ref: Reference; 95% CI: 95% confidence interval.

individuals who have high-risk injecting practices or less access to harm reduction services. However, this change in prevalence is not consistent throughout cities where the IBBS was implemented; suggesting another factor such as the forced repatriation mentioned above, may be at play.

Co-infection of HIV and HCV is one of the most important findings to result from the study as it has implications for epidemiology, prevention, and treatment of both diseases among PWID. Nasir et al. previously reported that HIV co-infection was independently associated with HCV viremia in three Afghan cities, highlighting the high risk of infection within PWID networks (Nasir et al., 2010). Individuals living with HIV/HCV co-infection are less likely to clear acute HCV infection and more likely to transmit the virus (Taylor et al., 2013) which is particularly salient for PWID who may be sharing used needles and other paraphernalia. With respect to clinical implications, HIV/HCV co-infection may also increase HCV progression to HCV-related liver disease and fibrosis (Kirk et al., 2013). Though treatment regimens for HCV (e.g., interferon free and interferon based treatments) have improved in recent years and are known to be effective (Pawlotsky, 2014), treatment of co-infected individuals has been associated with an increased risk of complications (Rotman and Liang, 2009). In addition, treatment response for HCV is worse among co-infected people, who have a higher risk of drug interaction, myeolosupression, and hepatotoxicity (Operskalski and Kovacs, 2011; Hughes and Shafran, 2006). Taken together, early identification of HIV and HCV infections with access to treatment and harm reduction services may be critical to reducing transmission both through reduction of viral load as well as through potentially effective behavioral changes (Cohen et al., 2011; Nasir et al., 2010).

History of imprisonment among participants of this sample was independently associated with HIV and HCV infection. Exposures to HIV and HCV in prisons are well documented and are associated with continued injecting practices and shared paraphernalia, unprotected same sex practices, and other exposures (Jurgens et al., 2011; Larney et al., 2013). Globally, two of every three prisoners with a history of injecting drug use are estimated to be infected with HCV (Larney et al., 2013). While harm reduction services were available in prison in Kabul and Herat, these were limited to voluntary counseling and testing, condom distribution, information, education, and communication, STI and HIV treatment (just in Kabul). Unfortunately, no needle and syringe exchange programs nor opioid substitution therapy were provided in prison settings, which are essential harm reduction interventions for PWID and would likely have a greater impact on transmission and acquisition of HIV and HCV infection (UNAIDS, 2014; personal communication with IBBS implementer).

Finally, when compared to Kabul and Herat, the study found a high proportion of PWID infected with HSV-2 and syphilis in Mazar-i-Sharif, which contrasts with the low prevalence observed for HIV in this city. This could reflect HIV transmission associated with sexual risk exposures not captured by this study, rather than attributed to injecting drug use. The IBBS survey for PWID was limited in its analysis of sexual risk. Further research would be required to examine these findings. However, given the higher risk of HIV acquisition among men and women who HSV-2 infected (Freeman et al., 2006), providing information about STI prevention through harm reduction services would be of value towards controlling HIV and other STIs.

4.1. Strengths and limitations

Limited availability of other rapid HIV testing kits in the country precluded the use of different HIV rapid tests kits for the sequential HIV testing process; thus screening was conducted using only SD Bioline HIV 1/2 for the entire sequential screening process (MoPH, 2008). The inability to procure different rapid test kits and subsequent use of the same test for all three steps required for HIV diagnosis could potentially result in misclassification of HIV status. This limitation was addressed through quality control measures, which identified no false tests in the sample when screening results were confirmed with ELISA.

Missing data due to logistical problems with the coupon management at the sites prohibited the calculation of RDS estimates to provide population prevalence estimates. Analyzed data could not be weighted for the sampling method; thus, only the crude and adjusted (non-weighted) sample estimates are provided. Nonetheless, RDS recruitment demonstrated successful reach to very hidden populations of PWID in each city.

Recruitment coupons and the questionnaires were only available in Dari, the main language in all three cities. However, Pashtoo, Uzbek, and Turkmen are also spoken, which might have resulted in immigrative selection bias. We have no record of people not being able to complete the questionnaire due to any language barrier and some participants may have spoken Dari in addition to their native language (personal communication with Dr. Sabawoon and Dr. Bromand).

Social desirability bias could also play a role in estimates given the stigma related to injecting drug use and diseases in this context. Similarly, injecting drugs and sexual behaviors vary over time and this research was limited to assessing prevalent infection using a relatively small number of variables that act as proxies for disease acquisition risks. Understanding risk factors for incident HIV and other injecting and sexually transmitted infections would merit a larger cohort study, which may not be feasible in the country's current climate of insecurity. Finally, it should be noted that correlates that were found to be significant in our models should not be used to infer causality, due to the cross-sectional design of the study.

5. Conclusion

The information resulting from this analysis serves to inform a comprehensive national response towards controlling and preventing the spread of HIV, HCV and other infectious disease among PWID in Afghanistan, with a priority focus on the city of Herat. Regional experience has shown the potential for a rapid rise in HIV seroprevalence among PWID within a narrow timeframe (Liitsola et al., 1998). Such experiences underscore the importance of rapid response and sustained implementation of harm reduction programs and scale-up of health services to control HIV and HCV transmission and improve health outcomes among PWID (Beyrer et al., 2009; CARHAP, 2006; Des Jarlais et al., 2013). As of 2010, only 18–28 needle and syringe programs were operating in the country (Mathers et al., 2010) and there was only one pilot opioid substitution therapy (OST) program in Kabul (WHO, 2011). Although access to needle and syringe exchange programs and other harm reduction services has been increasing in Kabul (Todd et al., 2011), scale-up and expansion of services should continue, aiming to provide a comprehensive package of harm reduction services, including OST, to cities were injecting drug use appears to have the highest impact.

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Contributors

All have read and approved this manuscript.

Conflict of interest

Dr. Feda Paikan is currently manager of the National AIDS Control Program

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.drugalcdep.2014.07.022.

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