

# Prevalence of HIV, Hepatitis C and its related risk behaviours among women who inject drugs in the Kathmandu Valley, Nepal: a cross-sectional study

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## Abstract

**Background:** People who inject drugs (PWID) are at great risk of HIV and Hepatitis C Virus (HCV). In order to properly design interventions and develop programmes for women who inject drugs, this study assessed the prevalence of HIV, Hepatitis B, Hepatitis C, and syphilis and its risk behaviours among women who inject drugs in the Kathmandu Valley, Nepal.

**Methods:** Through modified network sampling in three districts in the Kathmandu Valley, Nepal, this cross-sectional study enrolled a total of 160 women who inject drugs. Participants' serum samples were tested for HIV, HCV, Hepatitis B virus (HBV) and syphilis and risk behaviours were assessed through a structured questionnaire. Primary outcome variables were HIV, HCV, HBV and syphilis prevalence, and secondary outcome variables were sharing needles in the past month and using condom in last sexual intercourse. Stepwise logistic regression was used to determine micro- and macroenvironmental factors associated with secondary outcomes.

**Results:** The prevalence of HIV, HCV, and HBV was 8.8%, 21.3%, and 1.9%, respectively. HIV-HCV co-infection rate was 5.6%. Fifteen percent of women who inject drugs reported transactional sex for drugs or money. One in four women who inject drugs (27.5%) reported that they were imprisoned or detained for drug related reasons. In multivariable analysis, women living with HIV who inject drugs were almost four times more likely to use a previously used needle/syringe than women who inject drugs who were HIV negative (aOR: 4.2 CI: 1.1–15.9,  $p = 0.03$ ), but were almost four times more likely to use a condom during sexual intercourse (aOR: 3.5 CI: 1.1–28.9,  $p = 0.03$ ). Enrolment in family planning was the main determinant for using condoms in last sexual intercourse (aOR 4.9 CI: 1.6–16.7,  $p = 0.006$ ). Participants with access to HIV test and counselling (HTC) services were less likely to share needles (aOR: 0.3, 95% CI: 0.1–0.8,  $p = 0.01$ ).

**Conclusion:** Prevalence of HIV and HCV is high among women who inject drugs in Kathmandu valley of Nepal. Women who inject drugs enrolled in national programmes such as family planning and HTC were positively associated with condom use, and less likely to share needles.

**Keywords:** HBV, HCV, HIV, risk environment, sharing needles, STIs, transactional sex, women who inject drugs

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## Introduction

Compared to the general population, certain groups are at a higher risk to contract HIV, and to suffer from increased morbidity and mortality. These groups have been defined as 'key populations', and include sex workers, men who have sex with men, transgender and non-binary people, prisoners, and people who inject drugs (PWID).<sup>1</sup> Among key populations, the HIV prevalence can be five to 49 times higher than in the general population.<sup>1</sup> Worldwide, there is estimated to be around 12 million PWID, and out of them, approximately 1.6 million people are living with HIV.<sup>2</sup> In addition to HIV, Hepatitis C Virus (HCV) infection represents a large burden of disease among PWID.<sup>3</sup> Globally, approximately 10.8% of PWID have HIV-HCV co-infection.<sup>2</sup> In contrast to HIV and HCV, Hepatitis B Virus (HBV) is mainly transmitted through perinatal and horizontal transmission, especially in children. Although HBV can be transmitted through the exchange of syringes with individuals infected with HBV, it does not represent the main route of transmission of the virus.<sup>4</sup> Globally, HBV accounts for 1.1% of disability-adjusted life years (DALYs) among PWID.<sup>3</sup>

Sharing syringes and needles have been identified as major risk factors for the spread of HIV and HCV among PWID, as the viruses can stay in shared paraphernalia. Studies have found gender differences among PWID in terms of prevalence of HIV, HCV and other sexually transmitted infections (STIs), as well as differences in risk behaviours for these diseases<sup>5,6</sup> with women who inject drugs showing a higher prevalence of HIV and HCV risk-behaviours.<sup>5,6</sup> Women who inject drugs seem to be more at risk to either share needles, have sexual intercourse without condoms or both,<sup>7</sup> and there also seems to be an overlap in the sexual and injection partner of women who inject drugs.<sup>5</sup>

Another contributing factor to the high burden of STIs among PWID, especially women who inject drugs, is the drug-related stigma associated with this population.<sup>8,9</sup> Although the real dimension and impact of stigmatization is poorly understood, this represents one of the main barriers for an adequate collection of data to address tailored public health interventions and policies among PWID.<sup>10</sup> The burden of stigma among women who inject drugs and its consequences could be

more severe for this group compared to male injecting drug users due to women's pre-established role in society,<sup>11</sup> where women are expected to follow a set of social norms and fulfil a role as mothers,<sup>8</sup> and being an injecting drug users could be associated with 'failure' in the accomplishment of these imposed roles.<sup>8,11</sup> The stigma perceived by women who inject drugs from society leads to structural violence, thus resulting in a lack of access to education, employment, independence and exposing them to constant emotional harm.<sup>12</sup> This situation could be worsened in societies such as the South-Asian where women have a lower position in society compared to men.<sup>13</sup>

Nepal has a population of 29 million people,<sup>14</sup> with most of the population concentrated in the Terai Region, a lowland region in Southern Nepal, and in the central hilly region, where the capital city, Kathmandu, is situated. According to a report that mapped key populations in Nepal, there is estimated to be between 27,000 and 34,000 PWID in Nepal.<sup>15,16</sup> It is estimated that 7.2% of PWID population in the Kathmandu Valley are women.<sup>17</sup>

The estimated HIV and STI prevalence in Nepal are derived from studies among the general population of PWID, where women tend to be under-represented. With regards to women who inject drugs, the prevalence estimates of HIV and STIs vary, with HIV prevalence ranging from 9% to 28%.<sup>4,17</sup> Although data on the burden of HCV among women who inject drugs is scarce, a study from 2015 reported a HCV prevalence of 41.9% among a population of 401 men and women who inject drugs in Nepal.<sup>4</sup>

In Nepal, women must follow very strict cultural, religious, and social patterns, with different set of social practices, including early and arranged marriage, which enforces women to have a low social status and to play an expected role of subordination.<sup>18</sup> As a consequence of this perceived stigma from society, the women who inject drugs population tend to be secluded, and often consists of small groups residing in areas that are difficult to access for social and outreach workers, thus, making it harder to gather data and information about women who inject drugs to obtain a better understanding of this population.<sup>10</sup> The formation of small groups of PWID has been reported as an act of coping to protect against

stigma and emotional harm.<sup>12</sup> However, it also results in a strong bond between women who inject drugs and their male-partners which can function as a partnership for accessing drugs and managing risk.<sup>12</sup> A study conducted in Nepal showed that over 50% of women who inject drugs sold sex for drugs or money.<sup>19</sup>

In this study, we aimed to assess the prevalence of HIV, HBV, HCV and syphilis among women who inject drugs in the Kathmandu Valley, Nepal, as well as to determine micro- and macro environmental factors influencing main risk behaviours for the spread of these diseases.

## Methodology

### Study setting

The study took place in the Kathmandu Valley, including the Kathmandu (capital city), Lalitpur and Bhaktapur districts. A survey facility was established in Kathmandu, based on convenience of transportation and feasibility for the survey to address the population from the three districts.<sup>20</sup>

### Study design

The survey had a cross-sectional study design. The data was derived from the 'Integrated Biological and Behavioural Surveillance (IBSS) among Female Injecting Drugs User in Kathmandu Valley (Kathmandu, Lalitpur and Bhaktapur)' survey of 2016, conducted from June 2016 to August 2016, with both biological and behavioural data collected during this period.<sup>20</sup>

### Study sample

**Participants.** To be eligible to participate in the study respondents had to be females 16 years or older who had been injecting drugs for at least three months before the survey started, and resided in either the Kathmandu, Lalitpur or Bhaktapur districts of Nepal.

**Sampling strategy.** Participants were recruited through modified network sampling. Different steps were followed to develop the sampling frame for recruitment of potential surveys participants. NGOs working directly with women who inject drugs in Nepal (Sparsha Nepal and Drishti Nepal) were contacted to list down the potential

survey participants. The organizations contacted early responders, and asked them to invite other women who inject drugs that were not reached by the services provided by these institutions. Furthermore, male IDUs were asked to identify their partners who met the study's population criteria. After that, a sampling frame was created, and repeated participants were eliminated. A systematic random sampling was performed to the list, selecting 160 participants that were invited to enrol in the study after learning the benefits and risks of participating in the survey.<sup>20</sup> Respondents received a travel cost of 300 Nepalese Rupees (around 2.7 USD by 2016), together with a fruit juice to every respondent as an incentive to participate.

**Sample size calculation.** A total of 160 women who inject drugs sample size was determined by applying the following formula:

$$n = D \frac{\left[ z_{1-\alpha} \sqrt{2P_{hat}(1-P_{hat})} + z_{1-\beta} \sqrt{P_1(1-P_1) + P_2(1-P_2)} \right]^2}{(P_2 - P_1)^2}$$

Where  $n$  = sample size required per survey's round;  $D$  = design effect of 2;  $Z_{1-\alpha}$  = the  $z$  score for the desired confidence level, 1.960 for 95% confidence level for a two-sided test;  $Z_{1-\beta}$  = the  $z$  score for the desired power, 0.84 for 80%;  $P_1$  = .26 the estimated proportion at the time of the first survey;  $P_2$  = .11 the magnitude of change wanted to be able to detect, which for the IBBS survey was 15%;  $P_{hat} = (P_1 + P_2)/2$

**Data collection.** The survey consisted of open-ended, closed-ended, and multiple-choice questions, and was conducted through in-depth interviews by trained field workers. A consent form describing the objectives of the survey, the description of survey population, benefits, risks and confidentiality issues were clearly explained to the study participants in the presence of network operators and mobilisers. All participants received a specific identification number, and no personal identifiers were collected during the survey.<sup>20</sup> Clinicians referred patients in need of treatment to a specialized health centre after clinical assessment.

### Serological data collection

**HIV, HBV and HCV.** Participants were assessed for STIs clinically by trained health-care person-

nel. Blood samples were taken after oral witnessed consent, and tested for HIV. If the result of the first HIV test (Determine HIV 1/2) was positive, a second HIV test was performed using Uni-Gold HIV 1/2. If the second result was negative, a third test was performed using STAT PAK to conclude a result. Hepatitis B and Hepatitis C diagnoses were performed using Hepacard and HCV Tri-Dot kits, respectively.

*Syphilis.* Participants were tested for syphilis using a Rapid Plasma Reagin (RPR) card test. All samples non-reactive for RPR were recorded as negative, while positive samples were further tested with serial serum dilution up to 64 times, and results were recorded with dilution factor. All RPR positive samples were also tested by Treponema Pallidum Particle Agglutination (TPPA) test using Serodia TPPA as a confirmatory test. On the basis of titre of RPR, all RPR/TPPA positive samples were divided into 2 categories: Patients with TPPA-positive with RPR-negative or RPR-positive with titre below 1:8 dilutions were classified as showing a history of syphilis, and patients with TPPA-positive with RPR titre of 1:8 or greater were classified with a current syphilis infection requiring immediate treatment.

#### *Variables and data management*

*Outcome variables.* Primary outcomes variables were HIV, HBV, HCV and syphilis prevalence. Secondary outcome variables were: sharing needles, assessed through the question 'have you used previously used syringe/non-sterile syringe/needle in the last month', and condom use in last sexual intercourse which was assessed through the question 'the last time you had anal/vaginal/oral sex with a male sex partner did you and your partner use a condom?'.

*Independent variables.* Risk behaviour can be understood using a multilevel framework proposed by Glass and McAtee in 2005,<sup>21</sup> modified and adapted by Strathdee *et al.*<sup>22</sup> for PWID. This model proposes an overview on how physical, social, economic and political environments interact with micro environmental factors (injection locations, relationship dynamics, survival sex trade, coverage of harm reduction) and macro environmental factors (gender inequalities, justice, laws, trafficking patterns) to trigger or slow down HIV transmission:<sup>22</sup>

Micro environmental factors assessed are shown in Table 1 and Table 2. Macro environmental factors were assessed by the following questions: (a) Have you ever been imprisoned or detained for any reason? If the response was "yes" then the following question were asked: (b) In the past year, how many times have you been imprisoned for drug-related reason? and (c) Have you ever-injected drugs while in prison?

For the creation of knowledge scores of HIV and HCV, variables measuring knowledge were dichotomized and a value of '1' was assigned to correct answers from each variable while wrong answers, and non-responses were given the value '0'. The scores were later added and the median was set as the cut-off point value; scores below median were considered having little knowledge about risk behaviours for HIV and HCV infection (poor knowledge), and those with a score equal or above to the median were considered to have enough knowledge about HIV and HCV (good knowledge). HIV knowledge was assessed based on the standard comprehensive HIV knowledge questions, the so called BCEDF questionnaire.<sup>23</sup> HCV knowledge was assessed through the questions: (a) Can Hepatitis C be transmitted through sex?, (b) Can condoms protect you against Hepatitis C?, (c) Can Hepatitis C only occur if you have HIV?, (d) Can sharing needles transmit Hepatitis C?, (e) Can Hepatitis C be transmitted through tattooing?, (f) Is there a medical treatment for Hepatitis C?, (g) Can herbal remedies cure Hepatitis C? .

Risk behaviours assessed were time using drugs, time injecting drugs, and practice of sexual intercourse in exchange for money in the past year. Both variables 'time using drugs' and 'time injecting drugs' were categorized as 'less than two years', 'two to five years', and 'more than five years'. In the case of having sexual intercourse in exchange for money in the past year, it was dichotomized to 'yes' or 'no'.

#### *Statistical analysis*

Results were summarized with descriptive statistics (mean, median, and standard deviation for numerical variables, frequencies and percentages for categorical variables). Crude odds ratio (OR) and adjusted odds ratios (aOR) with their 95%

**Table 1.** Demographic characteristics of women who inject drugs in the Kathmandu, Lalitpur and Bhaktapur districts of the Kathmandu Valley, Nepal.

Variable	(N = 160)
	N (%)
Age	
Mean (range)	24 (17–39)
Age of the first injection	
Mean (range)	20 (10–39)
Marital Status	
Never married	69 (43.12)
Married	69 (43.12)
Divorced/Permanently separated	17 (10.62)
Living Together	5 (3.12)
Educational Status	
Illiterate	14 (8.75)
Literate	146 (91.25)
Current living situation	
Homeless on the street	3 (1.88)
Living in own home	57 (35.62)
Rented room	100 (62.50)
Crossed Indo-Nepal border for drugs	
No	135 (84.38)
Sometimes	25 (15.62)
Knowledge of where to get an HIV test	
No	12 (7.50)
Yes	148 (92.50)
The percentages may not add up to hundred percent for certain variables due to missing responses.	

confidence intervals (CI) are presented to assess association between independent and outcome variables. A  $p$ -value  $< 0.05$  was considered significant in the final models. Data analysis was performed using StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP.

## Results

### *Descriptive statistics*

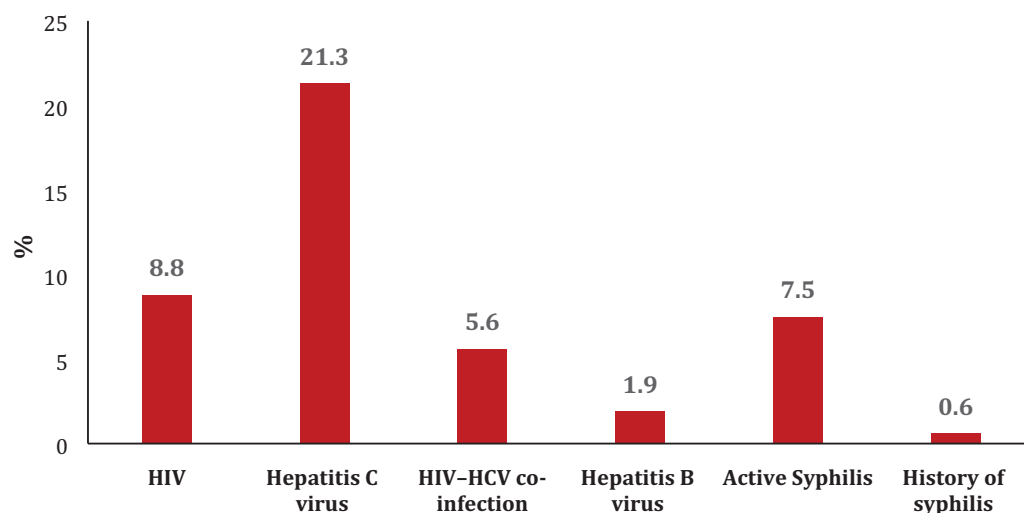
*Demographic characteristics.* Among the 160 women who inject drugs who responded the survey, the age ranged from 17 to 39 years old, and the mean age was 24 years ( $\pm 6$ ). The mean age of the first injection was 20 years ( $\pm 5$ ) and ranged from 10 to 39 years of age. Only 35.6% of the sample reported living in their own home, and 15.6% declared that they had crossed the India-Nepal border to get illegal drugs in the past year. Furthermore, 38.1% of women who inject drugs had been imprisoned for any reason, with a mean of two ( $\pm 3.2$ ) incarcerations in the past year. Also, 48.8% of women who inject drugs had a regular partner that also injected drugs, while 6.3% had a casual partner who also injected drugs (Tables 1 and 2).

*Prevalence of HIV, HCV, HBV and syphilis among women who inject drugs in Kathmandu Valley.* The prevalence of HIV and HCV was 8.8% and 21.3%, respectively, with a 5.6% HIV-HCV co-infection rate. Among the 160 women who inject drugs, the prevalence of HBV was 1.9%. With regards to syphilis, 0.6% of the women who inject drugs had a history of active syphilis, and 7.5% of the respondents presented active syphilis (Figure 1).

*Risk behaviours and micro environmental factors characteristics of the surveyed population.* Among the 160 women who inject drugs surveyed, 98.1% reported to have injected drugs the last month, and out of these 18.7% reported that they had used a previously used syringe or needle the past month, and 28.8% had injected drugs 4–6 times in the past week. Almost 59% of responders had not used a condom the last time they had anal, vaginal or anal sex with a male partner, and 15% had sexual intercourse in exchange for money or drugs in the past year (Table 2).

Out of the 160 respondents, 85.0% had access to new syringes and needles when in need, 89.4% knew of a place or person from which they could obtain condoms from, though only 28.1% obtained condoms free of cost from any organization in the past year (Table 2).

Regarding micro environmental factors, 77.5% had met, discussed, or interacted with peer educators (PE) or outreach educators (OR) during



**Figure 1.** Prevalence of HIV, HCV, HIV-HCV co-infection, HBV and syphilis.

the past year before the survey. A proportion of 68.1% of the survey participants had at least had one HIV test in their lifetime and 66.3% of the sample knew where they could get a confidential HIV test in their community. Out of the total respondents, 72.5% had visited a drop-in, counselling or information centre facility in the past 12 months, but only 18.8% had visited an HTC facility. Moreover, only 25% were currently enrolled in OST (Table 2).

*Factors associated with sharing needles.* Women living with HIV who inject drugs were four times more likely to share needles (aOR: 4.2, 95% CI: 1.1–16,  $p=0.03$ ) than women who inject drugs who were HIV negative. Participants that were involved in sex exchange for drugs or money were three times more likely to share needles (aOR: 3.4, 95% CI: 1.0–10.7,  $p=0.04$ ) than those who do not. Moreover, respondents that had access to confidential HIV counselling and testing in their community were 0.3 times less likely to share needles (aOR: 0.3, 95% CI: 0.1–0.8,  $p=0.01$ ) than those without access to confidential HIV counselling and testing (Table 3).

*Factors associated with condom use.* Participants enrolled in a family planning programme were almost five times more likely to use a condom in their last sexual intercourse (aOR: 4.9, 95% CI: 1.6–15.7,  $p=0.006$ ) than those not enrolled. Moreover, participants who reported to be able to obtain clean needles for injections were 0.2 times

less likely to use condoms (aOR: 0.2, 95% CI: 0.05–0.8,  $p=0.03$ ) than participants not able to get clean needles for injection purposes. Furthermore, women who inject drugs that have been using drugs for 2–5 years were less likely to wear a condom in their last sexual intercourse (aOR: 0.1, 95% CI: 0.04–0.7,  $p=0.01$ ) (Table 4).

### Discussion

The aim of this study was to investigate the prevalence of HIV, HCV, HIV/HCV co-infection, HBV and syphilis among women who inject drugs in the Kathmandu Valley of Nepal, and which micro and macro environmental factors influence risk behaviours in this population.

In this study the HIV prevalence was 8.8%, which is consistent with a sharp decline of HIV infections among male IDUs and women who inject drugs in Nepal, however it is still considerably higher than the HIV prevalence among the general population in the country, which in 2014 was 0.2%<sup>3</sup> and 0.15% by 2018.<sup>24</sup> Furthermore, the HIV prevalence in this survey is lower than what was observed among male PWID in 2015, who had a reported prevalence of 15.7%.<sup>4</sup> The higher prevalence among male PWID could be explained by gender norms fuelling risk behaviours in men, where a masculine role is associated with having multiple sex partners, unprotected sex, and alcohol and substances abuse. Moreover, in average, women are less reluctant to have medical

**Table 2.** Micro environmental factors among women who Inject Drugs in the Kathmandu, Lalitpur and Bhaktapur districts of the Kathmandu Valley, Nepal.

Variable	(N = 160)
	N (%)
Injected drugs in the past month	
No	3 (1.90)
Yes	157 (98.10)
Past-month syringe sharing (Using a used syringe)	
No	127 (79.40)
Yes	30 (18.80)
Frequency of injections (past week)	
Once a week	18 (11.30)
2–3 times a week	44 (27.50)
4–6 times a week	46 (28.80)
Once a day	5 (3.10)
2–3 times a day	33 (20.6)
Not injected in the past week	3 (1.90)
Condom use at last sex	
No	95 (59.40)
Yes	46 (28.80)
Transactional sex for money or drugs	
No	120 (75.00)
Yes	24 (15.00)
Able to get a condom from any NGO	
No	98 (61.25)
Yes	45 (28.12)
Met or interact with OR, PE or CM personnel in the past 12 months	
No	36 (22.50)
Yes	124 (77.50)
Ever had HIV test	
No	51 (31.88)
Yes	109 (68.12)
Able to get a confidential HIV test in their community	
No	40 (25.00)

*(Continued)***Table 2.** (Continued)

Variable	(N = 160)
	N (%)
Yes	106 (66.25)
Previous or current drug dependency treatment status	
Currently under	10 (6.25)
Was, but not now	40 (25.00)
Never received	110 (68.75)
Knowledge of a place or person where get a condom	
No	1 (0.62)
Yes	143 (89.38)
Knowledge of HCV risk factors	
Poor	80 (50.00)
Good	80 (50.00)
Knowledge of family planning existence	
No	3 (1.88)
Yes	157 (98.12)
Knowledge HIV risk factors	
Poor	112 (70.00)
Good	48 (30.00)
Currently enrolled in a family planning programme	
No	102 (63.75)
Yes	58 (36.25)
Able to get clean needles before injecting drugs	
No	24 (15.00)
Yes	136 (85.00)
Visited outreach services in the past 12 months	
No	44 (27.50)
Yes	116 (72.50)
Visited any HIV clinic in the past month	
No	147 (91.88)
Yes	13 (8.12)
Visited HIV test and counselling facility	
No	130 (81.25)
Yes	30 (18.75)

*(Continued)*

**Table 2.** (Continued)

Variable	(N = 160)
	N (%)
Currently enrolled in oral substitution therapy	
No	112 (70.00)
Yes	40 (25.00)
Imprisoned or detained for any reason	
No	99 (61.88)
Yes	61 (38.12)
Frequency of imprisonment or detained for drug-related reasons in the past year	
Mean (SD)	2.1 (3.2)
Imprisoned or detained for drug related reasons	
Yes	44 (27.50)
Have injected in prison	
Yes	3 (1.88)
Male regular partner also injects drugs	
Yes	78 (48.75)
Male casual partner also injects drugs	
Yes	10 (6.25)
Frequency of alcohol consumption during the previous month	
Every day	37 (23.12)
More than once a week	47 (29.38)
Less than once a week	51 (31.88)
Never drink alcohol	22 (13.75)
Occasionally	3 (1.88)
CM, Community mobiliser; NGO, Non-governmental organization; OR, Outreach worker; PE, Peer educator; SD, standard deviation. The percentages may not add up to hundred percent for certain variables due to missing responses.	

evaluations, more likely to know their HIV status, to engage in HIV prevention and treatment programmes, and to achieve viral suppression.<sup>25</sup> Differences in gender norms could partially explain a higher prevalence of some STIs among women, for example as a consequence of the dominant position men has over women. These results also highlight the importance of engaging

male PWID into HIV prevention and treatment in order to decrease the prevalence among women who inject drugs.<sup>25</sup>

The higher prevalence of both HIV and HCV among PWID could be due to the illegal status of drug injection in Nepal. Repressive drug policies have shown to be a barrier for uptake of core harm reduction services, such as needle and syringes programmes (NSP) and opioid substitution therapy, as law enforcement often target these facilities to arrest drug users.<sup>26</sup> Given that almost 28% of the women who inject drugs in this survey had been incarcerated for drug-related reason in the past year, this further highlights the vulnerability and barriers this group face in terms of HIV prevention.

Our study shows a greater prevalence of HCV among women who inject drugs compared to HIV, thus highlighting the importance of better understanding of Hepatitis C risk behaviours among women who inject drugs for the development of education and treatment programmes that can decrease the spread of HCV. Moreover, the high HCV prevalence among women who inject drugs could be decreased if treatment options for HCV is introduced to key populations, as new treatment regimens have been shown to be curative in more than 95% of patients;<sup>27</sup> only ART for HIV is available free of cost in Nepal, and people who have Hepatitis C cannot afford the high costs of HCV treatment. The World Health Organization already pledged for the elimination of 90% of Hepatitis C cases worldwide by 2030,<sup>28</sup> hence, we stress the importance of the inclusion of a national programme to access HCV treatment free of cost in Nepal.

In regard to HIV and HCV co-infection, we found a prevalence of 5.6%, which was lower than previously reported prevalence among people living with HIV in Nepal.<sup>29</sup> The neighbouring country India, reported a much higher rate of co-infection of 19.6%, although this was among male PWID.<sup>30</sup> Although no previous studies have addressed the co-infection rate among women who inject drugs, HCV infection is common among this population and with no widely available treatment, it is important to address the prevalence of HCV among women who inject drugs.<sup>19</sup>

The prevalence of HBV in this survey was 1.8%, while the prevalence of syphilis was 7.5%. The



**Table 3.** Independent variables associated with use of previously used syringe and/or non-sterile syringe or needle by women who Inject Drugs in Kathmandu Valley, Nepal.

Variable	OR	95%CI	p value	aOR	95% CI	p value
HIV test result						
Negative	1			1		
Positive	3.71	1.18–11.69	0.025	4.21	1.11–15.97	0.03
Involved in sexual intercourse in exchange for money or drugs in the past year						
No	1			1		
Yes	3.09	1.18–8.09	0.021	3.35	1.04–10.73	0.04
Possibility of acquiring a confidential HIV test in their community						
No	1			1		
Yes	0.32	0.13–0.77	0.12	0.28	0.10–0.79	0.01
Current living status						
Rented/homeless	1			1		
Own home	0.29	0.10–0.82	0.20	0.43	0.12–1.36	0.14
Source of syringe or needle in their last IV drug injection						
Someone else used	1			1		
New or reused my own needle	0.54	0.22–1.33	0.184	0.32	0.10–1.00	0.05
Access to clean/unused needle when in need						
No	1			1		
Yes	0.36	0.13–0.97	0.044	0.13	0.10–1.33	0.13

CI, confidence interval; OR, odd ratio; aOR, adjusted odds ratio.

prevalence of HBV was lower than what has been reported earlier.<sup>4,31</sup> In contrast, a much higher HBV prevalence was found in a population of male PWID in India in 2015, with a prevalence of 9.7%.<sup>30</sup> The low HBV prevalence in this population could be explained by a high coverage of Hepatitis B immunization in Nepal, which is around 87%.<sup>32</sup>

There is a lack of reports related to syphilis prevalence among key populations in Nepal, although a report in 2015 found a prevalence of 2% among male IDUs in the country.<sup>33</sup> Our study revealed a much higher prevalence, with 7.5% of the surveyed population presenting active syphilis. Our

findings are also higher than a recent publication that reported a prevalence of 0.7% among married women in rural areas of Nepal,<sup>34</sup> and higher than another publication reporting a prevalence of 0.7% women living with HIV in the country.<sup>35</sup> A higher prevalence of active syphilis among women who inject drugs could be related to sexual risk-behaviours such as exchange of sex for money or drugs, and having multiple sex partners.<sup>36,37</sup> Recent studies stress that increasing the availability of rapid tests for syphilis could increase the uptake of its screening, thus providing treatment and decreasing the prevalence among key population, especially among women who inject drugs.<sup>38</sup>

**Table 4.** Independent variables associated with condom use in the last anal/vaginal/oral sex with a male sex partner by women who Inject Drugs in Kathmandu Valley, Nepal.

Variable	OR	95% CI	p value	aOR	95% CI	p value
HIV Result						
Negative	1			1		
Positive	2.66	0.84–8.43	0.09	3.47	1.11–28.92	0.03
Enrolled in oral substitution therapy						
No	1			1		
Yes	25	0.09–0.71	0.009	0.36	0.09–1.49	0.16
Visiting a STIs specialized clinic in the last month						
No	1			1		
Yes	2.66	0.84–8.43	0.09	3.69	0.81–16.75	0.90
Currently under family planning						
No	1			1		
Yes	1.89	0.92–3.88	0.08	4.98	1.59–16.65	0.006
Time using drugs						
< 2 years	1			1		
2–5 years	0.34	0.54–0.15	< 0.001	0.16	0.04–0.68	0.01
> 5 years	0.4	0.59–0.22	< 0.001	0.32	0.08–1.28	0.1
Obtain clean needles						
No	1			1		
Yes	0.37	0.14–0.96	0.04	0.21	0.05–0.81	0.02

CI, confidence interval; OR, odd ratio.

### Conclusions

The high prevalence of HIV, HCV and syphilis among women who inject drugs in Nepal highlights the need for tailored interventions and prevention programmes for this group. The high prevalence of HCV among women who inject drugs further emphasizes the need for a national programme to access HCV treatment free of cost in Nepal. Family programmes tailored to women in Nepal appear to considerably reduce risk behaviours among women who inject drugs, however, enrolment in these services remains low. Understanding barriers and facilitators for its participation could decrease the prevalence of both HIV and Hepatitis C among

women who inject drugs in Nepal. Moreover, in order to increase the participation of this population in harm reduction and STIs screening and treatment programmes, differences of risk behaviours and motivators for uptake of services between women and men who inject drugs must be acknowledged and addressed prior to implementation. As women who inject drugs appear to share some risk behaviours with female sex workers who have a high uptake of health services and lower prevalence of STIs, experiences from already established programmes tailored to female sex workers could serve as a model to tackle the burden of STIs among women who inject drugs.

### Author contributions

Conceptualization: K.D. Original draft: J.D. and M.S.. Critical revision of original draft and approval of final manuscript: J.D., K.D., M.S., L.R.P., and G.M.

### Conflict of interest statement

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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### Ethical approval

The study was ethically approved by the Nepal Health Research Council (Reference number Reg. no. 03/2015). All participants gave verbal and witnessed consent before taking part in the study and no information which could identify individuals were collected in the survey. The study used verbal and witnessed consent for all study participants because the study population are a highly stigmatized population and drug possession is also criminalized in Nepal. Nevertheless, no personal identifications were collected during the data collection. The Nepal Health Research Council approved verbal witnessed consent to be obtained.

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### References

- UNAIDS. Global HIV & AIDS statistics, <https://www.unaids.org/en/resources/fact-sheet> (2019, accessed 13 May 2021).
- United Nations Office on Drugs and Crime. World drug report 2020, <https://www.unodc.org/wdr2017/index.html> (2017, accessed 13 May 2021).
- Degenhardt L, Charlson F, Stanaway J, *et al.* Estimating the burden of disease attributable to injecting drug use as a risk factor for HIV, hepatitis C, and hepatitis B: findings from the Global Burden of Disease Study 2013. *Lancet Infect Dis* 2016; 16: 1385–13984.
- Kinkel H-T, Karmacharya D, Shakya J, *et al.* Prevalence of HIV, Hepatitis B and C infections and an assessment of HCV-genotypes and two IL28B SNPs among people who inject drugs in three regions of Nepal. *PLoS ONE* 2015; 10: e0134455.
- Evans JL, Hahn JA, Page-Shafer K, *et al.* Gender differences in sexual and injection risk behavior among active young injection drug users in San Francisco (the UFO Study). *J Urban Health* 2003; 80: 137–146.
- Esmaeili A, Mirzazadeh A, Carter GM, *et al.* Higher incidence of HCV in females compared to males who inject drugs: a systematic review and meta-analysis. *J Viral Hepat* 2017; 24: 117–127.
- Girchenko P and King EJ. Correlates of double risk of HIV acquisition and transmission among women who inject drugs in St. Petersburg, Russia. *AIDS Behav* 2017; 21: 1054–1058.
- Spooner C, Saktiawati AMI, Lazuardi E, *et al.* Impacts of stigma on HIV risk for women who inject drugs in Java: a qualitative study. *Int J Drug Policy* 2015; 26: 1244–1250.
- Lan C-W, Lin C, Thanh DC, *et al.* Drug-related stigma and access to care among people who inject drugs in Vietnam. *Drug Alcohol Rev* 2018; 37: 333–339.
- World Health Organization. Global health sector strategy on viral hepatitis 2016–2021, <https://apps.who.int/iris/bitstream/handle/10665/246177/WHO-HIV-2016.06-eng.pdf?sequence=1&isAllowed=y> (2017, accessed 13 April 2019).
- Khuat OTH, Morrow M, Nguyen TNN, *et al.* Social context, diversity and risk among women who inject drugs in Vietnam: descriptive findings from a cross-sectional survey. *Harm Reduct J* 2015; 12: 35.
- Rhodes T, Rance J, Fraser S, *et al.* The intimate relationship as a site of social protection: partnerships between people who inject drugs. *Soc Sci Med* 2017; 180: 125–134.
- Ambekar A, Rao R, Agrawal A, *et al.* Pattern of drug use and associated behaviors among female injecting drug users from northeast India: a multi-centric, cross-sectional, comparative study. *Subst Use Misuse* 2015; 50: 1332–1340.
- The World Factbook. Central Intelligence Agency, [https://theodora.com/world\\_fact\\_book\\_2019/nepal/index.html](https://theodora.com/world_fact_book_2019/nepal/index.html) (accessed 13 April 2019).
- Poudel T, Gupta S, Bhattarai R, *et al.* Mapping and size estimation of key populations on HIV surveillance in Nepal. *J Gandaki Med Coll-Nepal* 2019; 12: 39–42.

16. Deuba K, Shrestha U, Rawal BB, *et al.* Mapping and size estimation of hidden key populations in low-income setting experiencing concentrated HIV epidemic: the case of Nepal. *J Med Internet Res*. Epub ahead of print 16 September 2018. DOI: 10.2196/preprints.11269.
17. Ghimire B, Suguimoto SP, Zamani S, *et al.* Vulnerability to HIV infection among female drug users in Kathmandu Valley, Nepal: a cross-sectional study. *BMC Public Health* 2013; 13: 1238.
18. Lamichhane P, Puri M, Tamang J, *et al.* Women's status and violence against young married women in rural Nepal. *BMC Womens Health* 2011; 11: 19.
19. Azim T, Bontell I and Strathdee SA. Women, drugs and HIV. *Int J Drug Policy* 2015; 26: S16–S21.
20. National Centre for AIDS STD and Control. Integrated Biological and Behavioral Surveillance (IBBS) Survey among Female injecting drug users in Kathmandu Valley, Round 1, 2016, <https://www.aidsdatahub.org/resource/ibbs-fidu-nepal-kathmandu-valley-round-1-2016>
21. Glass TA and McAtee MJ. Behavioral science at the crossroads in public health: extending horizons, envisioning the future. *Soc Sci Med* 2006; 62: 1650–1671.
22. Strathdee SA, Hallett TB, Bobrova N, *et al.* HIV and risk environment for injecting drug users: the past, present, and future. *Lancet* 2010; 376: 268–284.
23. Kakchupati S, Paudel T, Maharjan M, *et al.* Systematic differences in HIV, Syphilis and Risk behaviors among street based and establishment based female sex workers in Kathmandu valley of Nepal. *Nepal J Epidemiol* 2016; 6: 620–630.
24. National Centre for AIDS and STD | Control, Fact sheet 1: HIV epidemic update of Nepal, <http://www.ncasc.gov.np/WAD2018/FACTSHEET-2018-FINAL/Factsheet-2018-final.pdf> (2018)
25. UNAIDS. Progress towards the 90–90–90 targets, 2017, <https://www.unaids.org/en/90-90-90#:~:text=There%20has%20been%20progress%20towards,81%25%20had%20supressed%20viral%20loads>.
26. Csete J, Kamarulzaman A, Kazatchkine M, *et al.* Public health and international drug policy. *Lancet* 2016; 387: 1427–1480.
27. Foster GR, Gane E, Asatryan A, *et al.* ENDURANCE-3: safety and efficacy of glecaprevir/pibrentasvir compared to sofosbuvir plus daclatasvir in treatment-naïve HCV genotype 3-infected patients without cirrhosis. *J Hepatol* 2017; 66: S33.
28. Hurley R. Slashed cost of hepatitis C drugs spurs drive to eliminate the disease. *BMJ* 2018; 361: k1679.
29. Poudel KC, Palmer PH, Jimba M, *et al.* Coinfection with hepatitis C virus among HIV-positive people in the Kathmandu Valley, Nepal. *J Int Assoc Provid AIDS Care* 2014; 13: 277–283.
30. Ray Saraswati L, Sarna A, Sebastian MP, *et al.* HIV, Hepatitis B and C among people who inject drugs: high prevalence of HIV and Hepatitis C RNA positive infections observed in Delhi, India. *BMC Public Health* 2015; 15: 726.
31. Nelson PK, Mathers BM, Cowie B, *et al.* Global epidemiology of hepatitis B and hepatitis C in people who inject drugs: results of systematic reviews. *Lancet* 2011; 378: 571–583.
32. World Health Organization. Immunization coverage, <https://www.who.int/news-room/fact-sheets/detail/immunization-coverage> (accessed 13 April 2019).
33. National Centre for AIDS and STD | Control. Country progress report, 2015, <http://www.ncasc.gov.np>
34. Shakya S, Thingulstad S, Syversen U, *et al.* Prevalence of sexually transmitted infections among married women in rural Nepal. *Infect Dis Obstetgynecol* 2018; 2018: 4980396.
35. Poudel KC, Poudel-Tandukar K, Palmer PH, *et al.* Coinfection of sexually transmitted infections among HIV-positive individuals: cross-sectional results of a community-based positive living with HIV (POLH) study in Nepal. *J Int Assoc Provid AIDS Care* 2017; 16: 338–346.
36. Van den Hoek A, van Haastrecht HJ and Coutinho RA. Heterosexual behaviour of intravenous drug users in Amsterdam: implications for the AIDS epidemic. *AIDS* 1990; 4: 449–453.
37. Lewis DK and Watters JK. Sexual risk behavior among heterosexual intravenous drug users: ethnic and gender variations. *AIDS* 1991; 5: 77–83.
38. Gupte S, Daly C, Agarwal V, *et al.* Introduction of rapid tests for large-scale syphilis screening among female, male, and transgender sex workers in Mumbai, India. *Sex Transm Dis* 2011; 38: 499–502.