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Risky Sexual Behavior and HIV/STI among Injecting Drug Users in India: Findings from Large-Scale Bio-Behavioral Surveys in Nagaland, Manipur and Maharashtra, India

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Abstract

Injecting Drug Users (IDUs) are vulnerable to sexually transmitted infections (STIs) and human immunodeficiency virus (HIV) as they are exposed to unsafe practices such as needle sharing and unprotected sex. This study utilized data from surveys conducted in India by Integrated behavioral and Biological assessment (IBBA) Phase 1 (2005-06) and Phase 2 (2009-10) in states having highest HIV/STIs prevalence. The study examines socio-demographic characteristics and factors of consistent condom use and consequential STI symptoms among IDUs and the results showed the mean age of IDUs has increased from 26 years to 29 years in the second round of survey. The IDUs are more likely to be unmarried, illiterate and unemployed in both surveys. Multivariate analysis revealed that IDUs in second round of IBBA were significantly 14 times more likely to started first injecting drug after two years of first drug use than the first round of IBBA. The IDUs who have a regular partner and share their needle or syringe were less likely in showing the consistency of condom use with multiple sex partners. Policy framework and interventions with a central focus on IDUs is vital as users above 30 years old who were illiterate and shared needle/syringes were likely to contract HIV.

Keywords

STI/HIV; injecting drug users; unsafe sex; sharing needles or syringe

Introduction

In India, injecting drug users (IDUs) are the focal group for targeted interventions due to the persistent rise in HIV prevalence among them who are considered as a high-risk group. Recent national estimates suggest that HIV prevalence is significantly higher among IDUs (9.9%) than among female sex workers (FSWs) (2.2%) and homosexual men or have sex with men (MSM) (4.3%), while programs and policies have been implemented among FSWs and MSM to reduce the prevalence of HIV. However, those have had little impact among IDUs (NACO, 2015). It has to be emphasized the IDUs in India are exposed to HIV risks due to their unsafe practices such as needle sharing and engaging in risky sexual behaviors, thus increasing their vulnerability to STI and HIV. Some IDUs are also sex workers who contribute to the risk of spreading HIV and STIs. According to UNAIDS, the spread of HIV in several North African and Middle Eastern countries are being facilitated by a combination of injecting drug use and sex work, with one-third of IDUs involved in paid for sex (UNAIDS, 2014). In short, IDUs who are involved in unsafe sex practices not only put themselves at risk but also facilitate transmission of HIV among the general populations (Singh et al., 2015). Several studies have identified the dual risk behavior of injecting drug users, such as sharing needle/syringes and unprotected sex expose their sexual partners to contracting HIV/AIDS (Mishra et al., 2014; Solomon et al., 2011; Eicher et al., 2000; Solomon et al., 2010).

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The foremost challenge for India in curbing HIV is to identify a relevant strategy to address the interface of drug and sex (Panda & Kumar, 2016). Surveys conducted in Asian countries found unprotected sexual practices among IDUs led to HIV transmission from the former to non-injecting drug users (Pisaniet al., 2003). The high risk of HIV transmission assumes even greater significance in the milieu of regular sexual relationships where condom is much less frequently used compared with transactional sexual encounters (Panda et al., 2007). An important predictor of HIV infection among IDUs is sharing of needle/syringes (Makarenko et al., 2017; Jain et al., 2014; Armstrong et al., 2014). Several studies have documented that there are a number of socio-demographic, cultural and other factors consistently associated with unsafe injecting practices, although IDUs are more likely to use needles/syringes and have overlapping sexual and injection partners (Makarenko et al., 2017; Bennett et al., 2000; Coffin et al., 2015 & Evans et al., 2003).

The states of Manipur and Nagaland in India have the largest number of IDUs whereby the practice of unsafe injecting drug use is the most important cause of HIV epidemic here (Venkateshet al., 2013 & Emery et al., 2008). Manipur which has a population of around 2.5 million, has an estimated 38,000 IDUs. An overwhelming IDUs in Manipur and Nagaland are males, where approximately 2% of the adult population in these states are engaged in injecting drugs, largely heroin and spasmo-proxyvon. Situated in the far North-East of India Manipur and Nagaland are mountainous states sharing the international border with Myanmar, where illicit drugs are readily accessible (Ganju et al., 2016 & Lalmuanpuii et al., 2013). Mumbai, the most populous city in India and its financial capital, has a HIV prevalence of 20% among its IDUs compared with 20% among female sex workers (FSW) and 16% among male homeosexuals (NACO, 2008). Majority of IDUs in Mumbai/Thane reported initiation of injecting drug at much older age compared with those in Manipur and Nagaland, which accounted for every one among three being new injectors. Maharashtra accounts for 18 percent - the highest reported rates of HIV prevalence among female sex workers. Similarly, in 2007, higher rates were recorded among IDUs (24%) and men who have sex with men (12%), and at antenatal care clinics (0.5%) in 2007 (NACO, 2008).

In North-eastern states and in Maharashtra, research has document widespread association between unsafe sex practices and injecting drug use with sexually transmitted infections (STI) and HIV prevalence in six districts. Irrespective of regional differences, the high-risk behavior of needle sharing and low condom use makes IDU a critical sub-population for HIV prevention interventions (Mahantaet al., 2008).

Against this backdrop, the study is aimed at understanding the pattern in HIV related risk behaviors and prevalence of STI/HIV among injecting drug users in three states with high HIV prevalence in India, namely Manipur, Nagaland and Maharashtra. The study used a data on the Integrated behavioural and biological survey which was a large scale bio-behavioural survey conducted in (2005-2006) (round-1) and 2009-2010) (round-2) in India. The specific objectives of the study are to understand the changes in injecting and risky sexual behaviors among IDUs and to determine the socio-demographic and behavioural correlates of STI/HIV over the study period.

Data and Methodology

The study used secondary data sourced from two separate cross-sectional surveys: Integrated Behavioral and Biological Assessment (IBBA) round-1 and round-2. The first round of IBBA was conducted in 2005-2006 and the second round in 2009-2010. The surveys were undertaken by Indian Council of Medical Research, National AIDS Research Institute, in partnership with Family Health International and was implemented in close collaboration with National AIDS Control Organization (NACO) and State AIDS Control Societies (SACS). The IBBA was funded by the Bill and Melinda Gates Foundation (BMGF) and was conducted in Avahan projects in Andhra Pradesh, Maharashtra, Tamil Nadu, Karnataka, Manipur and Nagaland and along the selected stretch of National Highways. The survey adhered to the prescribed guidelines from the ethical committee of Indian Council of Medical Research (ICMR) and from FHI360's Protection of Human Subjects Committee (PHSC). The IBBA collected data from the six districts that were purposely selected because of their socio-cultural background and large number of IDUs from among the districts where Avahan was intervening. The districts were Churachandpur and Bishnupur in Manipur, Phek and Wokha in Nagaland, and Mumbai and Thane in Maharashtra. The IDUs from these six districts were recruited from a cross-sectional survey on HIV risk behaviors and HIV and STI biological markers. In IBBA, IDUs were operationally defined as any man, 18 years or older, who has injected drugs for non-medical reasons at least once in the last six months. The sample size for each district was approximately 400 (a combined sample size of 400 was used for Mumbai and Thane (termed 'Mumbai/Thane') and respondent-driven sampling (RDS) method used. A total of 2,075 IDUs in round one and 1,977 in round two were interviewed in the IBBA.

The RDS is a variant of chain-referral sampling; it relies on drawing recruits from the personal networks of initial and subsequent respondents. Additionally, it employs a dual system of structured compensation: one for being interviewed and another for recruiting peers to be interviewed. Selection of respondents for respondent driven sampling was done through a system of peer recruitment involving initial identification of 6-8 diverse "seeds", who were members of the high-risk population, purposively selected from among various networks to participate in the survey. Each seed was issued three coupons to recruit members of the population who met the eligibility criteria and who were "known" to them (i.e., not strangers). Additional seeds were selected during the survey if the earlier seeds did not succeed in developing active recruitment chains.

Measures

District level data from the three states were first aggregated for each round of IBBA. Data from both rounds were then pooled. Bivariate analysis was undertaken to examine the changes in the key demographic characteristics. Injecting behaviour and sexual behaviour of IDUs between two rounds of IBBA were also examined.

Determinates of the three primary outcome measures were examined i.e., consistent condom use with FSWs, including paid, casual or regular FSWs and having any STI symptoms. Clients who have reported using condoms every time when they had sex with a paid partner or casual partner and a regular FSW were categorized as 'consistent condom users'. The IDUs tested positive for any STI, which is syphilis, gonorrhea or Chlamydia, were categorized as having any STI while IDUs having tested for HIV were categorized as HIV positive and HIV negative.

Multivariate binary logistics regression was conducted to assess the change in key outcomes in both the IBBA rounds and after controlling for confounding, including socio-demographic factors, there were differences found between two rounds of IBBA. These included age, marital status, occupation, literacy, sharing of needle/syringes in the past one month, age at first injecting drugs, age at first drug use, duration between first drug use to first injecting drugs, sexual partner as injecting drug users, number of sexual partners in the past 12 months, engaging in paid for sex in the past 12 months, had sex with casual or regular partners and condom used in theh last sex encounter with partners and consisted condom use with different female partners. Factors that were significant in bivariate analysis were then included in the adjusted binary logistics regression where dependent variables are, duration between first drug use to first injecting drugs ≥ 2 years, sharing of needle/syringes in the past one month, condom use in last sexual encounterwith regular female partner, condom use in last sexual act with paid female partner, consistent condom use with paid female partner, consistent condom use with regular female partners, condom used in last sex encounter with casual partners, HIV seropositivity and having any STI symptoms in the past 12 months. The study used *p<0.10 at the 10% level of significance, **p<0.05 at the 5% level of significance and ***p<0.01 at the 1% level of significance as all the dependent variables are very sensitive. In this study, we have used 10% level of significance to measure the change in each outcome variable over the rounds. Measuring level of significance at 10% is very common particularly when sample size is not very large. Notably, there are some studies which have reported that 10% level of significance is acceptable for small sample sizes (Greenland et al., 2016 & Lang et al., 1998). In the present study, the total sample size to measure the changes in each round was 1,047: 612 and 435 respondents for round-1 and round-2 respectively. Therefore, we have used 10% level of significance. All statistical analysis was conducted using STATA version 13.0.

Results

Data from 4,052 IDUs from the six districts of Manipur, Nagaland, and Maharashtra were analysed. Table 1 shows the distribution of IDUs based on IBBA round-1 and IBBA round-2 respectively according to socio-demographic, biological and behavioural characteristics. The mean age of the IDUs in IBBA round-1 was 26 years and 29 years in IBBA round-2. The majority of the IDUs were illiterate, unmarried, and employed and about 71% were below 20 years of age in round-1, whereas, it declined in round-2 to 46%. There was significant decline in percentage of IDUs aged 20 years or below from round-1 (48%) to round-2 (34%). A greater decline was observed in the percentage IDUs those who have initiated injecting drug use practices within the first year of drug use from IBBA round-1 (54%) to IBBA round-2 (15%). It was also observed sharing needle/syringes in the past one month among IDUs significantly reduced from 57% in 2005-06 to 31% in 2009-10. About 54% of IDUs (in the first round of the survey) had sexual encounters in the preceding 12 months while this proportion decreased to 47% in the second round. A significant finding from the bivariate analysis showed sexual partners of the IDUs (50%) were also injecting drug users. Consistent condom use with main regular partners significantly reduced 2006 between (IBBA round 1) and 2010 (IBBA round 2) even though consistent use of condom during sex with paid partners and casual partners has increased from round-1 to round-2. Biological indicators HIV infection did not change significantly during 2006 to 2010. A very rapid decline in any STI symptoms was reported between round 1(16.6%) and round-2 (4.9%).

Table 1: Socio-demographic characteristics of Injecting Drug Users in IBBA round-I and round-II (Aggregate level for Manipur, Nagaland & Maharashtra)

Background	Round 1	Round 2	P value (Karl Pearson)
Current age			
18<24 Years	43.3	26.9	0.000
25-29 Years	26.7	31.5	
≥ 30 Years	29.9	41.6	
Literacy			
literate	81.6	80.0	0.204
Marital status			
Not currently married	79.3	68.9	0.000
Currently married	20.7	31.1	
Main Occupation			
Unemployed	45.7	36.3	0.000
Student	11.1	6.6	
Employed	43.2	57.0	
Age at first drug use			
≤20 Years	71.2	45.8	0.000
21-25 years	19.7	23.5	
≥26 Years	9.2	30.7	
Age at first injecting drug use			
≤20 Years	48.1	33.9	0.000
21-25 years	30.2	35.9	
≥26 Years	21.7	30.2	
Duration between first drug use to first injecting drugs			
<2 Years	53.9	15.0	0.000
≥2 Years	46.1	85.0	
Sharing needle/syringes in the past one month			
No	43.1	68.6	0.000
Yes	56.9	31.4	
No. of partners had sex in last 12 months			
<2	47.1	52.9	0.002
≥ 2	52.6	47.4	
Sexual partner as injecting drug users			
No	53.9	46.1	0.065
Yes	49.0	51.0	
Partners type and condom use behaviours			
Paid for sex in last 12 month	50.3	53.7	0.301
Condom use in last sex with paid partners	69.0	81.2	0.001
Consistent condom use with paid partners	83.3	7.9	0.000
Has main regular partner	59.8	60.6	0.638
condom use in last sex with main regular partner	35.0	39.0	0.070
Consistent condom use with main regular partners	67.8	36.7	0.000
Has casual sex in last 12 month	44.7	24.4	0.000
Condom use in last sex with casual partners	56.2	61.1	0.110
HIV positive			
Yes	16.8	16.7	0.935
Any STI symptoms in the past 12 months			
Yes	16.6	4.9	0.000
Total	**2,075**	**1,977**	

Table 2 presents crude and adjusted odds ratios (AOR) of risky behaviors related to drug use and sex in addition to biological indicators of IDUs based on the IBBA surveys. In multivariate analysis, duration between first drug use to first injecting drug use more than or equal to 2 years was 14 times higher during round-2. The results showed IDUs were significantly less likely to practice consistent condom use with their paid partners and main regular partners in both the rounds. Condom use during last sex with casual partners were 1.34 times (p<0.10) significantly higher in IBBA round-2. Biological indicators also showed significantly lower level of odds ratio in round-2.

Table 2: Multivariate analysis for Injecting behaviors and risky sexual behavior among injecting drug users in India

Behaviors	COR / IBBA		AOR	
	Round 1	Round 2	Round 1	Round 2
Duration between first drug use and first Injecting drugs ≥ 2 years	Reference	6.629***	Reference	14.986***
Sharing of needle/syringes in the past one month		0.347***		0.223***
Condom use last during sex act with Paid female partner		1.938***		1.038*
Consistent Condom use with Paid female partner		0.017***		0.013***
Condom use during last sex act with regular female Partner		1.186*		1.296**
Consistent condom use with regular Female partner		0.275***		0.248***
Condom use during last sex act with casual partner		1.126		1.343*
HIV		0.993		0.711***
Any STI symptoms in the past one year		0.256***		0.243***

*COR= Crude Odds Ratio; AOR =Adjusted Odds Ratio; *** p<0.01; ** p<0.05; * p<0.10*

Table 3 shows factors associated with consistency in condom use with different type of female sexual partners (paid, casual and main regular). The IDUs were more likely to consistently use condom with different female partners whereby those who are literate (AOR=3.082, p<0.01), paid for sex in the past month (AOR=9.390, p<0.01), had casual sex in past 12 months (AOR= 3.042, p<0.05). The IDUs who had a main regular partner and shared needle/syringe with others partners were less likely to practice consistency in use of condom in sexual encounters with different female partners in both the surveys.

Table 3: Factors of consistent condom use with FSWs (Paid, casual and main regular), India

Background	**Consistent condom use%**	**AOR**
Current age (years)		
<24 ®	81.3	1.000
25-29	72.0	1.037
≥ 30	66.8	1.296
Literacy		
Illiterate®	62.1	1.000
Literate	73.9	3.082***
Marital Status		
Not currently married®	79.7	1.000
Currently married	62.0	1.875
Age at first drug use (years)		
≤20 ®	75.4	1.000
21-25	68.5	0.626
≥26	70.5	0.723
Age at first injecting drug use (years)		
≤20 ®	80.4	1.000
21-25	72.4	0.761
≥26	63.3	0.44
Duration between first drug use to first injecting drugs (years)		
<2 ®	69.1	1.000
≥2	72.6	1.271

Background	Consistent condom use%	AOR
Sharing needle/syringes in the past one month		
No®	74.3	1.000
Yes	70.8	0.456**
No. of partners had sex in last 12 months		
<2®	66.5	1.000
≥ 2	82.0	0.738
Sexual partner as injecting drug users		
No ®	72.4	1.000
Yes	80.3	1.369
Paid for sex in last 12 months		
No ®	63.1	1.000
Yes	92.5	9.390***
Has casual sex in last 12 months		
No ®	68.4	1.000
Yes	79.9	3.042**
Has main regular partner		
No ®	83.9	1.000
Yes	68.7	0.305**

*® Reference; *** p<0.01; ** p<0.05; * p<0.10; AOR= Adjusted odds ratio*

Table 4 illustrate the factor associated with experienced at least one STI symptoms in the past 12 months and HIV seropositivity among IDUs in India using binary logistic regression. Logistics regression analysis of IDUs who experienced any STI symptoms in the past 12 months indicate that those who are literate (AOR=1.878, p<0.10), age at first injecting drugs 26 years and above (AOR=2.192, p<0.05) and sharing needle/syringes in the past month (AOR=2.218, p<0.01) were significantly more likely to have any STI symptoms in the past 12 months. Consistent condom use with FSWs also shows the factor associated with HIV seropositivity among injecting drug users. The multivariate analysis also showed IDUs 30 years and above (AOR=15.951, p<0.01), literate (AOR=3.42) and shared needle/syringes in the past one month were significantly more likely to have HIV seropositivity. Those who practiced injecting drugs at age 21 and above and had main regular partner were less likely to have HIV infection.

Table 4: Binary logistic regression odds ratios for experienced at least one STI symptoms in the past 12 months and HIV seropositivity among IDUs in India

Background Characteristics		Experienced at least one STI symptom in the past one year		HIV seropositivity	
		Yes (%)	AOR	Yes (%)	AOR
Current Age (years)	≤24 s®	10.5	1.000	5.2	1.000
	25-29	9.6	0.986	12.9	1.818
	≥30	12.3	0.969	31.3	15.951***
Literacy	No®	11.2	1.000	13.6	1.000
	Yes	10.8	1.878*	17.5	3.415***
Marital Status	Currently not married®	10.4	1.000	14.7	1.000
	Currently married	10.5	1.331	23.2	0.778
Main Occupation	Unemployed®	10.1	1.000	14.9	1.000
	Student	8.6	1.026	1.9	1.002
	Employed	12.0	0.939	20.8	1.427
Age at starting drug use (years)	≤20 ®	11.8	1.000	13.4	1.000
	21 - 25	10.1	0.581	18.0	1.759
	26	8.9	0.382	25.3	1.487

Background Characteristics		Experienced at least one STI symptom in the past one year		HIV seropositivity	
		Yes (%)	AOR	Yes (%)	AOR
Age at first injecting drugs (years)	≤20 ®	11.3	1.000	15.3	1.000
	21 - 25	9.7	1.388	16.2	0.464**
	26	11.7	2.192**	19.7	0.173***
Duration between first drug use and first drug injection (years)	<2 years®	12.0	1.000	16.7	1.000
	≥2	10.3	0.601**	16.7	0.819
Shared needle/syringe in the past month	No®	7.8	1.000	18.0	1.000
	Yes	13.7	2.218***	17.2	1.694**
Number of sexual partners in the last 12 months	<2®	10.4	1.000	21.1	1.000
	≥2	14.4	1.003	8.8	0.753
Are sexual partners also injecting drug users	No®	10.9	1.000	16.5	1.000
	Yes	20.8	1.542	17.3	1.694
Paid for sex in the last 12 months	No®	17.0	1.000	23.6	1.000
	Yes	22.0	0.736	18.5	0.657
Casual sex in the last 12 months	No®	9.7	1.000	21.4	1.000
	Yes	12.5	1.427	8.8	1.068
Has regular sexual partners	No®	13.3	1.000	20.9	1.000
	Yes	10.6	0.649	14.7	0.495**
	No®			16.0	1.000
Any STI Symptoms in the past one year	Yes			22.9	1.179

*® Reference; *** p<0.01; ** p<0.05; * p<0.10; AOR=Adjusted Odds Ratio*

Discussion and Conclusions

The study showed a significant reduction in the risky acts related to drug use and sexual encounters behavior among IDUs in the three Indian states examined here which have high prevalence in terms of drug use and STIs. Over the last two decades, India has been implementing a number of HIV prevention programs targeted at IDUs to encourage safe sharing of needles by introducing needle exchange and condom promotion programs in addition to oral substitution therapy (OST), also known as harm reduction services, for people who are IDUs in the three states with high HIV prevalence. Therefore, a considerable decline in risky behaviors were observed in the proportion of young injecting drug users (18-24 years) from 2006 to 2010, but the proportion of older IDUs (25 years and above) increased over the period. The finding of the study revealed majority of IDUs initiated first injecting drug use before 25 years of age in each of the three states. This may be due to the fact that young age is a phase of experimentation where peer influence and pressure are a catalyst. These findings are consistent with other studies which also reported early initiation of injecting drug among the users (Mishra et al., 2014; Armstrong et al., 2014 and Sarna et al., 2012). Many of the male IDUs began the injecting drugs during their adolescent years, and several studies have pointed out younger age and earlier age of drug use initiation are associated with HIV infection (Boxten et al., 2004; Fuller et al., 2003; Fennema et al., 1997 and Carneiro et al., 1999). This contribute to policy and program challenges, some of which may be sensitive in the ultra-conservative context of India. This change is negligible, which may be mainly due to larger drug dependency restricting behavioral changes at relatively older age. This paper has contributed to a greater understanding of the differences between younger and older People Who Inject Drugs (PWID) to introduce targeted HIV prevention programs (Armstrong et al., 2014). Findings of the study suggested majority of IDUs first began their injecting practices after 2 years of first drug use in IBBA round 2 (2009-10) which showed the increased proportion of IDUs.

In order to understand the dynamics of injecting drug use, the practice of the sharing of needle/syringes is extremely important for any harm reduction programme and prevention

intervention of HIV transmission of and other infections that occur through sharing of non-sterile injection equipment and drug preparations. Sharing of injecting equipment with another partner exposes the IDUs to greater HIV risks and subsequent transmission. It is promising to observe that in each of the three states examined in the study, there has been a noteworthy decline in the proportion of needle/syringes sharing in the two rounds of IBBA. This could be the result of implementation of prevention programs, such as needle/syringe exchange programs and oral substitution therapy (OST). In fact, a small-scale qualitative study may be suitable to understand why there has been such a significant decline in HIV incidents within a short period of less than three years. The findings are useful to study other districts/states.

Findings also suggested condom use in the last sex encounter with different female partners have considerably increased but at the same time, injecting drug users who are engaged in unprotected sex with paid or casual partners also reported less likelihood of persistent condom use with regular sexual partners.

This unprotected sexual behavior among IDUs could be due to their perception that they won't contract HIV and subeqently would not transmit the disease to their partners in addition to fears that disclosing their risky injecting practices might lead to them losing their regular sexual partners. (Panda *et al.,* 2005; Mishra *et al.,* 2014 & Jain *et al.,* 2011). Observations indicate a high probability of HIV transmission within intimate partner relationships. Therefore, there is a need for special and sustained efforts that can reduce HIV transmission to their regular sexual partners who are currently not covered in the HIV prevention intervention programs due to lack of knowledge. The finding of this study also revealed IDUs having a primary and regular sexual partner and sharing needle/syringes with other injecting partners were least likely to practice consistency in condom use. These findings are precarious in light of recent estimates of new IDU epidemics emerging in some selected states and districts of India (NACO, 2012 & Mishra *et al.,* 2014). This situation points to the need for HIV prevention interventions programs to focus on the risk of sexual transmission of STI/HIV in drug use setting beyond the risk associated with IDUs needle/syringes practices (Mishra *et al.,* 2014). Further, the study has also attempted to determine the socio-demographic and contextual factor associated with sexually transmitted infections (STIs) and HIV. Findings revealed educated, older IDUs and who share the needle/syringes were more prone to have HIV seropositivity. One of the important findings that emerged from the study is that female partners of injecting drug users are also IDUs themselves and are more likely to have HIV seropositivity. Hence, HIV prevention program for IDUs need to adopt a partner-based approach to efficiently break these routes of HIV transmission.

In conclusion, findings of the study suggested educated and older IDUs, who engage in risky behaviors such unsafe needle/syringes sharing practices and unprotected sex with regular sexual partners have exposed them to the unnecessary risk of HIV transmission. Therefore, ongoing needle/syringe exchange programs and harm reduction programs should also focus on condom use in all relationships, especially intimate partner relationships, in addition to addressing the unsafe injecting drug use practices in the high HIV prevalence states of India.

Although, the findings of the study have important implications for HIV prevention programs and research, the present study has some limitations. First, the findings of the study are based on self-reported data, and hence, certain behaviors may have been influenced by recall and social desirability bias, and as a result, socially unacceptable behaviors may have been under-reported. Second, data for each district was collected independently by using respondent driven sampling (RDS) method and an unweighted

analysis conducted at the state level by combining the districts. Therefore, the representativeness of the sample is similar to that of a large snowball sample. This also shows the RDS method to recruit participants creates limitations for multivariate analysis. This is especially so since guidelines for multivariate analysis of RDS data are still underdeveloped and require validation. Despite this limitation, RDS results in probability-based estimates of various participant characteristics. The cross-sectional study in nature henceforth, casual relationships could not be firmly concluded due to the difficulty in determining the temporal relationship between the predictors and the outcomes. Finally, study findings cannot be generalized to all IDUs across the country as injecting drug use practices in India vary across states.

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