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Prevalence and Correlates of Sexual Risk Behaviors Among Drug Users in Western China: Implications for HIV Transmission

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Abstract

The prevalence and correlates of sexual risk behaviors among drug users in western China and the implications for HIV transmission in this population are described. A cross-sectional survey of male drug users was conducted in methadone maintenance therapy clinics and detoxification centers in three western provinces of China between September 2009 and December 2010. Participants in the study completed a questionnaire about demographics, HIV/AIDS knowledge, drug use history, sexual risk behaviors, and other psychosocial variables. Factors associated with HIV sexual risk behaviors were identified by multiple logistic regression analysis. Of 1,304 drug users surveyed, nearly 54% never used condoms during sexual intercourse with a spouse or cohabitant, and this behavior was associated with coming from Chongqing (OR = 1.86, $p < 0.05$), being aged 36 and older (OR = 5.03, $p < 0.05$), being married or cohabiting (OR = 1.68, $p < 0.05$), having first taken drugs at age 30 and above (OR = 1.80, $p < 0.05$), and having received AIDS advice or detection from authorities in the past year (OR = 1.95, $p < 0.05$). Twenty-six percent had had sex with casual sexual partners in the past year, and this behavior was associated with being married or cohabiting (OR = 0.30, $p < 0.05$), first taking drugs at age 31 and above (OR = 0.42, $p < 0.05$), and receiving AIDS advice or HIV detection from authorities in the past year (OR = 0.70, $p < 0.05$). About 34% never used a condom when having sex with casual sexual partners, and this behavior was associated with coming from Guangxi (OR = 2.81, $p < 0.05$) or Chongqing (OR = 2.73, $p < 0.05$). Almost 14% had had commercial sex in the past year, and this behavior was associated with coming from Guangxi (OR = 6.26, $p < 0.05$) or Chongqing (OR = 5.44, $p < 0.05$) and having exchanged needles or received clean needles from the Needle Exchange Centers in the past year (OR = 2.76, $p < 0.05$). Nearly 23% had never used condoms when having commercial sex, and this behavior was associated with having received free condoms from authorities in the past year (OR = 0.26, $p < 0.05$). Sexual risk behaviors among drug users in Guangxi, Chongqing, and Xinjiang are common. Additional intervention strategies are needed to control the spread of HIV in this population.

Introduction

At the end of 2011, approximately 780,000 people were estimated to be living with HIV/AIDS in China.[1] Heterosexual transmission accounts for more than half of the cases since 2007.[2–4] Drug users acquire HIV infection by sharing needles, having sex with HIV-infected partners, or both, making them a "dual risk" group.[5–7] In China, it was estimated that 29.4% of HIV transmissions were through injecting drugs, and 37.9% were through heterosexual sex in 2007.[4]

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Drug users are considered a bridge population as they are at high risk of HIV infection due to their risk behaviors and they frequently transmit HIV to the general population.[8,9] For this reason, the strategies to control HIV transmission in this population may differ from the approaches in the general population.

The sexual behaviors in this population could be influenced by drug use[10] and may differ from those in the general population.[11,12] Previous studies have shown that drug users worldwide are likely to engage in high-risk sexual behaviors. In Atlanta, Georgia, drug users exhibited high levels of sexual risk behaviors; 61% of drug-using men had two or more female partners in the preceding 3 months and 51% did not use a condom when they last had intercourse.[11] In Italy, Russia, and Uzbekistan, drug users were found to have multiple sex partners in the preceding months,[13–15] and most of them reported having sex without condoms.[14] In India and Vietnam (Asia) and in Kenya (Africa), drug users were more likely to have multiple sex partners compared with nondrug users[12,16,17] and were more likely to visit commercial sex workers[12] in the past year. In China, 30–75% of drug users reported having multiple sexual partners.[5,9,10] Commercial sexual behaviors among them were also fairly common.[9] They inconsistently used condoms when having sex with their spouses or commercial sexual partners.[9,10] These high-risk sexual behaviors contributed to a high incidence of HIV infection among drug users.[10] Among injection drug users (IDUs) who were undergoing methadone maintenance therapy (MMT), sexual transmission is likely to be a more important route of HIV transmission than needle sharing. While the number of drug users in China is increasing continuously, knowledge concerning their sexual risk behaviors needs to be updated,[6,18,19] and additional investigation of the sexual behaviors of this population is urgently needed.

In this study, we collected and analyzed data from drug users in Guangxi, Sichuan, and Xinjiang provinces, three western provinces with high rates of drug use and high rates of HIV infection among drug users in China.[20] Our goal was to determine the characteristics and correlates of sexual risk behaviors in the drug using population in these areas. The information obtained from this study will be crucial in the development of targeted HIV prevention strategies for this high-risk population.

Materials and Methods

Study site and participants

A cross-sectional survey was conducted by face-to-face structured interviews with drug users from MMT clinics and detoxification centers in Guangxi, Chongqing, and Xinjiang provinces in western China. All subjects in these clinics from September 2009 to December 2010 were screened for eligibility for the study. We recruited participants who were male and had taken any type of drugs for more than 6 months. The subjects who were unable to provide voluntary informed consent or who were suffering from severe mental illness, mental retardation, or language disorder were excluded. The study was approved by the Ethics and Human Subjects Committee (EHSC) of the Guangxi Medical University.

Data collection

The questionnaire consisted of 83 items that utilized both closed and open-ended questions. It was designed with the primary aim of obtaining information on the participant's sexual behaviors and the acceptability of an intervention (male circumcision) to prevent HIV infection. The questionnaire had four subsections: demographic characteristics, general knowledge about HIV/AIDS, general knowledge about and willingness to accept the intervention, and behaviors related to sex or drugs. The variables of sexual behaviors were assessed by asking close-ended questions, such as "Did you have sex with casual partners in the past year?" with answers of "Yes/No." In our questionnaire, we designed 10 items about knowledge of AIDS. Every correct answer received a point and the total score was used to assess the participant's knowledge of AIDS. Data were collected by trained Research Assistants (RAs). After the participants provided their signed informed consent to participate in this investigation, RAs conducted detailed interviews according to the structured guidelines.

Statistical analysis

All data collected from questionnaires were doubly checked for completeness and consistency. Data were then entered into EpiData 3.1 for Windows (The EpiData Association, Odense, Denmark) and analyzed using SPSS for Windows Version 16.0 (SPSS, Chicago, IL). Descriptive statistics and univariate analyses were generated for each of the variables corresponding to specific questions in the survey. To compare the basic characteristics of the two groups, the chi-squared test was used. Multivariate logistic regression analysis was performed to identify factors associated with a certain high-risk sexual behavior. The variables included in the logistic regression model were those that showed a statistically significant association ($p < 0.05$) with the sexual risk behaviors in the univariate analyses. All statistical tests were two-sided with a significance level of $p < 0.05$.

Results

Characteristics of participants

A total of 1,386 subjects were investigated by face-to-face interviews and 94.1% of subjects ($n = 1304$) completed the entire questionnaire. Of these participants, 42.6% ($n = 556$) were from Guangxi, 31.3% ($n = 408$) from Chongqing, and 26.1% (n = 340) from Xinjiang (Table 1). The participants were aged 15 to 91 years with over half (72.6%) of them aged 36 or older; 92.5% were Han ethnicity, 46.3% were married or cohabiting, 82.8% had an educational level equal to high school (junior or senior) or higher, and 43.9% were employed.

Of the participants, 79.3% had first taken drugs before age 31, 78.6% had received MMT, 73.1% had received AIDS advice or HIV detection from governmental authorities, 60.7% had received print or electronically distributed materials on AIDS or sexually transmitted diseases (STDs), 25.1% had received peer education about AIDS, 19.6% had received any number of free condoms from authorities, and 16.2% had exchanged needles or received clean needles from the Needle Exchange Centers in the past year. Most of the participants (97.8%, $n = 1275$) had had sexual intercourse. The participants showed good knowledge about AIDS, with an average score

Table 1. Demographic Characteristics of the Participants ($N = 1304$)

Variables	n	%
Source of samples (different regions)		
Guangxi	556	42.6
Chongqing	408	31.3
Xinjiang	340	26.1
Ages		
≤24	44	3.4
25–35	313	24
≥36	947	72.6
Ethnic group		
Han	1,206	92.5
Other ethnicity	98	7.5
Marital status		
Single	523	40.1
Married or cohabiting	604	46.3
Divorced/separated/widowed	177	13.6
Education level		
Elementary school or below	222	17
Junior high school	682	52.3
Senior high school or above	398	30.5
Employment status		
Not employed	731	56.1
Employed	573	43.9
Grades of AIDS knowledge[a]		
Less than average grades	531	40.7
Average grades or more	773	59.3
Age at first taking drugs		
≤19	491	37.7
20–30	543	41.6
≥31	179	13.7
Refused to answer	91	7
Received methadone maintenance therapy in the past year		
Yes	1,025	78.6
No	279	21.4
Received AIDS advice or detection from authorities in the past year		
Yes	953	73.1
No	351	26.9
Received educational materials on AIDS or sexually transmitted diseases (STD) in the past year		
Yes	792	60.7
No	512	39.3
Received peer education on AIDS in the past year		
Yes	327	25.1
No	977	74.9
Received any free condoms from authorities in the past year		
Yes	255	19.6
No	1,049	80.4
Exchanged needles or received clean needles from the Needle Exchange Center in the past year		
Yes	211	16.2
No	1,093	83.8
Ever had sexual intercourse ($n = 1304$)		
Yes	1,275	97.8
No	29	2.2
Frequency of having sex with spouse or cohabitant in the past year ($n = 780$)[b]		
One time or above every week	388	49.7
Less than one time every week	282	36.2
Never	84	10.8
Refused to answer	26	3.3
Frequency of using condoms when having sex with spouse or cohabitant in the past year ($n = 685$)[b]		
Never	368	53.7
Sometimes	206	30.1
Always	111	16.2
Ever had sex with casual partners in the past year ($n = 1,262$)[b]		
Yes	322	24.7
No	940	72.1
Frequency of sexual intercourse with casual partners in the past year ($n = 335$)[b]		
1	161	12.3
2	64	4.9
≥3	83	6.4
Refused to answer	27	2.1
Frequency of using condoms when having sex with your casual partners in the past year ($n = 328$)[b]		
Never	112	34.1
Sometimes	97	29.6
Always	119	36.3
Ever received commercial sexual services by paying or giving drugs in the past year ($n = 1,275$)[b]		
Yes	189	14.8
No	1,075	82.4
Refused to answer	11	0.8
Frequency of commercial sexual services by paying or giving drugs in the past year ($n = 200$)[b]		
1	71	5.4
2	46	3.5
≥3	59	4.5
Refused to answer	24	1.8
Frequency of using condoms when having sex with commercial sexual partners in the past year ($n = 200$)[b]		
Never	44	22.0
Sometimes	41	20.5
Always	109	54.5
Refused to answer	6	3.0
Ever had sex with the same gender as yours in the past year ($n = 1,275$)		
Yes	15	1.2
No	1,255	96.2
Refused to answer	5	0.4
Had symptoms of urogenital infection, such as painful urination in the past year ($n = 1,304$)		
Yes	149	11.4
No	1,149	88.1
Refused to answer	6	0.5

[a]Ten items in the questionnaire were designed to assess knowledge about AIDS, with each correct answer given a point, and the total score was calculated after all 10 items were done. The average score for all interviewed subjects is 9.3.

[b]The numbers are different as some did not answer the question.

of 9.3 (out of 10), and 59.3% ($n=773$) scored 9.3 or higher (Table 1).

Predictors of high-risk sexual behaviors

Condom use when having sex with spouse or cohabitant. Of the 1,304 participants, 780 (59.8%) had a spouse or cohabitant, and 670/780 said that they had had sexual intercourse with their spouses or cohabitants. However, a large number of respondents (368/685, 53.7%) never used condoms during sexual intercourse with their spouses or cohabitants (Table 1). In the univariate analyses, we found 10 factors that were significantly associated with condom use during sexual intercourse with spouses or cohabitants: region of residence, age, marital status, educational level, employment status, age at first taking drugs, having received peer education of AIDS, having received any free condoms from authorities, having received AIDS advice or detection from authorities, and having received print or electronically distributed materials about AIDS or STDs (Table 2). Multivariate analyses identified six significant variables that were associated with not using condoms: being from Chongqing, being aged 36 or older, being married or cohabiting, having first taken drugs at age 30 or above, and having received AIDS advice or testing from governmental authorities in the past year. Receiving free condoms from authorities in the past year was associated with higher odds of condom use (Table 2).

Sex with casual partners. Of 1,262 respondents, 322 (25.5%) had had sex with casual partners in the past year (Table 1). In the univariate analyses, having casual sex was associated with age, marital status, age at first taking drugs,

Table 2. Baseline Factors Associated with Not Using Condoms When Having Sex with Spouse or Cohabitant in the Past Year (Logistic Regression, $N=685$)

Factor	*Univariate OR (95% CI)*	*Final model OR (95% CI)*	p
Source of samples			
Xinjiang	1.00	1.00	
Guangxi	2.043 (1.384–3.017)	1.572 (0.980∼2.520)	0.060
Chongqing	1.974 (1.363–2.861)	1.856 (1.178∼2.925)	0.008
Ages			
≤24	1.000	1.00	
25–35	3.448 (0.947–12.551)	3.137 (0.824∼11.950)	0.094
≥36	5.976 (1.682–21.235)	5.034 (1.344∼18.856)	0.016
Marital status			
Single	1.000	1.00	
Married or cohabiting	2.129 (1.373–3.300)	1.684 (1.045–2.714)	0.032
Divorced/separated/widowed	1.928 (0.961–3.870)	1.419 (0.669–3.009)	0.362
Education level			
Elementary school or below	1.000		
Junior high school	1.178 (0.745–1.862)		
Senior high school or above	0.604 (0.376–0.972)		
Employment status			
Not employed	1.000		
Employed	0.669 (0.495–0.905)		
Age at first taking drugs			
≤19	1.000	1.00	
20–30	1.542 (1.101–2.159)	1.191 (0.802–1.768)	0.387
≥31	2.217 (1.355–3.627)	1.795 (1.021–3.156)	0.042
Refused to answer	1.180 (0.564–2.468)	1.281 (0.553–2.965)	0.563
Received peer education on AIDS in the past year			
No	1.000		
Yes	0.684 (0.476–0.984)		
Received any free condoms from authorities in the past year			
No	1.000	1.00	
Yes	0.460 (0.316–0.669)	0.497 (0.321–0.770)	0.002
Received AIDS advice or testing from authorities in the past year			
No	1.000	1.00	
Yes	1.662 (1.162–2.376)	1.952 (1.290–2.955)	0.002
Received educational materials on AIDS or STD in the past year			
No	1.000		
Yes	0.702 (0.513–0.960)		

OR, odds ratio; CI, confidence interval.

Table 3. Baseline Factors Associated with Having Sex with Casual Partners in the Past Year (Logistic Regression, $N = 1262$)

Factor	*Univariate OR (95% CI)*	*Final model OR (95% CI)*	p
Ages			
≤24	1.000		
25–35	0.751 (0.370–1.523)		
≥36	0.493 (0.249–0.974		
Marital status			
Never married	1.000	1.00	
Married or live together	0.261 (0.195–0.350)	0.299 (0.221–0.405)	0.000
Divorced/separated/widowed	0.587 (0.401–0.859)	0.743 (0.495–1.115)	0.151
Age at first taking drugs			
≤19	1.000	1.00	
20–30	0.797 (0.605–1.049)	0.984 (0.717–1.351)	0.920
≥31	0.319 (0.194–0.525)	0.419 (0.243–0.723)	0.002
Refused to answer	0.715 (0.412–1.241)	0.554 (0.289–1.065)	0.076
Exchanged needles or received clean needles from the Needle Exchange Center in the past year			
No	1.000		
Yes	1.402 (1.009–1.948)		
Received methadone substitution treatment in the past year			
No	1.000		
Yes	0.679 (0.503–0.916)		
Received AIDS advice or testing from authorities in the past year			
No	1.000	1.00	
Yes	0.636 (0.483–0.838)	0.701 (0.508–0.968)	0.031

having exchanged needles or received clean needles from the Needle Exchange Centers, having received methadone substitution treatment, and having received AIDS advice or detection from authorities (Table 3). In multivariate analyses, the variables associated with not having casual sex were being married or cohabiting, first taking drugs at age 30 or above, and having received AIDS advice or detection from authorities in the past year.

Condom use when having sex with casual sex partners. Of those who had had sex with casual sex partners ($n = 328$), 34.1% (112/328) never used a condom in these circumstances (Table 1). In univariate analyses, the use of condoms was associated with the participant's region, ethnic group, having received MMT, and having received any free condoms from authorities (Table 4). In multivariable logistic regression analyses, coming from Guangxi or Chongqing was associated with a decreased odds of condom use, whereas the odds of condom use was increased if the participant was of "other ethnicity" and reported receiving free condoms from authorities in the past year.

Commercial sex. Of the participants, 13.5% (176/1304) had had commercial sex (i.e., paid money or gave drugs for sex) in the past year (Table 1). In the univariate analyses, we found that four factors were significantly associated with the frequency of commercial sex: participant's region, grades of AIDS knowledge, age of first taking drugs, and having exchanged needles or received clean needles from the Needle Exchange Center (Table 5). In multivariate analyses, the predictors of having commercial sex were being from Guangxi or from Chongqing and having exchanged needles or received clean needles from Needle Exchange Centers in the past year.

Condom use during commercial sex. Of those who had had commercial sex ($n = 194$), 22.7% (44/194) never used condoms (Table 1). In the univariate analyses, we found three factors that were significantly associated with using condoms during commercial sex: having received any free condoms from authorities, having received AIDS advice or detection from authorities, and having received print or electronically distributed materials about AIDS or STD (Table 6). In multivariate analyses, the only variable significantly associated with using condoms during commercial sex was having received free condoms from authorities in the past year.

Discussion

Up to now, the prevention of HIV among intravenous drug users primarily focused on decreasing the incidence of needle sharing through needle exchange programs and needle-related educational campaigns. However, as shown in this study, high-risk sexual behaviors among drug users are fairly common, including multiple sexual partners, commercial sex, exchanging sex for drugs, and having sex without using condoms. In the modern social network, drug use may be a key linkage connecting individuals.[21,22] The risk of transmitting HIV from this population to the general population may be more common through sexual transmission. It is vital to explore and characterize the sexual behaviors of drug users in order to improve HIV prevention strategies worldwide.

Table 4. Baseline Factors Associated with Not Using Condoms When Having Sex with Casual Partners in the Past Year (Logistic Regression, $N = 328$)

Factor	*Univariate OR (95% CI)*	*Final model OR (95% CI)*	p
Source of samples			
Xinjiang	1.000	1.00	
Guangxi	2.679 (1.390–5.161)	2.814 (1.427–5.546)	0.003
Chongqing	3.400 (1.723–6.709)	2.730 (1.291–5.777)	0.009
Ethnic group			
Han	1.000	1.00	
Other ethnicity	0.160 (0.037–0.695)	0.168 (0.038–0.753)	0.02
Received methadone substitution treatment in the past year			
No	1.000		
Yes	1.865 (1.069–3.254)		
Received any free condoms from authorities in the past year			
No	1.000	1.00	
Yes	0.524 (0.287–0.955)	0.489 (0.263–0.907)	0.023

In this study, we found that a substantial proportion of participants never used condoms when they had sexual intercourse with their spouses/cohabitants (54%), casual sexual partners (34%), or commercial sex workers (22%). These results are concerning and unfortunately are similar to the findings reported from other places in the world.[10,15,23–25] Despite the expense of providing free condoms, such a strategy was found to be significantly associated with reported condom use in every type of sexual contact (i.e., spouse, casual, or commercial) and should continue to be a key component of future HIV prevention efforts. Unexpectedly, receiving AIDS advice or testing from governmental authorities was associated with a higher risk of not using condoms with spouses or cohabitants. Potential explanations for this finding include complacency of the patient after receiving a negative HIV test result or participants who are engaging in higher risk behavior may be more likely to seek out HIV testing and advice. It is important to emphasize that condom use is effective and useful to protect both the participants and the partners during HIV testing and counseling sessions.

The rates of condom use and commercial sexual activities among drug users in different areas in China were different. Subjects in Chongqing were more likely not to use condoms when having sex with their fixed sexual partners (spouse or cohabitant), and subjects in Guangxi and Chongqing were more likely not to use condoms when having sex with casual partners. This finding indicates that education concerning condom use in these three areas is insufficient. In addition, we found that only 15% of respondents in our study had commercial sex in the past year, which is much lower compared with a study conducted in Shenzhen, Guangdong province that reported 44% of drug users had commercial sex in the past year.[9] Subjects in Shenzhen, one of the most economically and culturally developed areas in China, may have more open attitudes toward sexual behaviors than subjects in other areas. These results demonstrate that high-risk sexual behaviors vary dramatically among different areas in China, suggesting that different AIDS control strategies toward drug users should be implemented in these areas.

Interestingly, a sign of "separation between knowledge and practice" was found in our study. The participants showed

Table 5. Baseline Factors Associated with the Use of Commercial Sexual Services (Logistic Regression, $N = 176$)

Factor	*Univariate OR (95% CI)*	*Final model OR (95% CI)*	p
Source of samples			
Xinjiang	1.000	1.00	
Guangxi	7.609 (2.146–26.975)	6.264 (1.675–23.421)	0.006
Chongqing	5.122 (1.398–18.759)	5.441 (1.419–20.854)	0.013
Grades of AIDS knowledge			
Less than average grades	1.000		
Average grades or more	0.544 (0.289–1.026)		
Age at first taking drugs			
≤19	1.000		
20–30	0.677 (0.345–1.329)		
≥31	1.957 (0.603–6.354)		
Refused to answer	0.000		
Exchanged needles or received clean needles from the Needle Exchange Center in the past year			
No	1.000	1.00	
Yes	3.498 (1.674–7.307)	2.756 (1.122–6.77)	0.027

Table 6. Baseline Factors Associated with Not Using Condoms When Having Sex with Commercial Sexual Partners in the Past Year (Logistic Regression, $N = 194$)

Factor	*Univariate* OR (95% CI)	*Final model* OR (95% CI)	p
Received any free condoms from authorities in the past year			
No	1.000	1.00	
Yes	0.223 (0.065–0.764)	0.262 (0.074–0.920)	0.037
Received AIDS advice or testing from authorities in the past year			
No	1.000		
Yes	0.546 (0.277–1.078)		
Received educational materials on AIDS or sexually transmitted diseases (STD) in the past year			
No	1.000		
Yes	0.544 (0.276–1.071)		

good knowledge about AIDS (with an average score of 9.3/10 on a test of knowledge), but the rates of high-risk sexual behaviors reported from them were very high. Similar results were found from two previous studies of IDUs in China.[10,26] Although 98%[10] and 82%[26] of drug users have good knowledge of HIV, up to 74.2%[10] reported having shared needles and participating in high-risk sex. These results demonstrate that the current educational campaigns among drug users in China may be insufficient and should be combined with other HIV prevention methods. A number of other factors were also found to be associated with high-risk sexual behaviors in our study. We found that initiating drug use over age 30 decreased the chance of having sex with casual partners. This finding is similar to that reported in a study by other researchers, which showed a decreasing rate of high-risk sexual behavior with each decade of age.[27] Thus, for those individuals who initiate drug use at an older age, HIV transmission may be less likely to occur through high-risk sexual contact than through other means, such as needle sharing. Not surprisingly, participants who were married or cohabiting or received AIDS advice or testing from authorities were more likely to reduce casual sexual behaviors, suggesting that a stable relationship between drug users and their partners can reduce high-risk sexual behaviors. Interestingly, the drug users who ever exchanged needles or received clean needles from Needle Exchange Centers were more likely to have commercial sex. One possible explanation is that they consider that the clean needles will decrease their risk of HIV infection and they will be "safe." In other words, exchanging and receiving clean needles has an "inhibition elimination effect" on having commercial sex. However, different results were shown by other studies. A study in Italy found that condom use among IDU males was more common than among non-IDU males, and IDU males were more likely to have an HIV-negative partner.[13] A study in the United States also showed that participation in the needle exchange program may help reduce the absolute risk of HIV sexual transmission, including increasing the odds of condom use and reducing more unprotected vaginal intercourse among the participants.[28] Thus, in China, condom use should be an important focus of sexual education at needle exchange centers, where sexual education focuses predominantly on the damage of taking drugs as well as HIV risk.

Several limitations of our study should be acknowledged. First, this is a cross-sectional study. There has been some evidence that long-term drug use affects pituitary-thyroid function,[29] impairs the function of the secondary sex organs,[30] decreases men's libido,[10,31] and decreases the rhythm of sexual activity in men.[31] We focused only on the changes in sexual behavior among drug users in the past year and had no data of their previous sexual practices; we also did not uncover an association between time of first drug use and sexual activities among drug users and how these risky sexual behaviors impact HIV contraction eventually. Second, we did not collect data on the actual HIV status of these participants and whether knowing their status affected their sexual risk behaviors. Third, our study was limited to three provinces in China and was conducted only in male drug users, which might result in a potential selection bias. We were unable to determine whether other areas in China and female drug users had the same characteristics and sexual risk behaviors. Furthermore, alcohol use is also an important factor associated with not using condoms[32] and other sexual risk behaviors,[33,34] but this factor was not included in our study.

HIV is most commonly spread through unprotected sex with an infected partner. Individuals can reduce their risk of HIV infection by abstaining from sex, having one or few partners, or always using male or female condoms. Intervention strategies that focus on root causes such as sexual behaviors, rather than outcomes such as disease incidence, would have the maximum impact on HIV transmission.[35,36] In this study, only a minority of participants had received peer education of AIDS (25%), received any free condoms from authorities (20%), and had exchanged needles or received clean needles from Needle Exchange Centers (16%) in the past year, indicating that HIV prevention efforts in this population need to be greatly improved.

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