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Integrate HIV testing into drug treatment to increase testing uptake among male injecting and non-injecting drug users in Lashio, Myanmar: A cross-sectional study

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ARTICLE SUMMARY

Article focus

- To identify factors associated with HIV testing among injecting (IDUs) and non-injecting drug users (NIDUs) in Lashio, Myanmar

Key messages

- IDUs were more likely than NIDUs to have been tested for HIV.
- HIV testing rates were especially low among both IDUs and NIDUs engaging in risk behaviors.
- IDUs and NIDUs would benefit from integrating HIV testing services into drug treatment services.

Strengths and limitation of this study

- The first look at HIV testing that covered both IDUs and NIDUs
- Respondent driven Sampling was used to recruit participants.
- HIV testing was self-reported by drug users.
- Results may not be generalized to drug users in other cities of Myanmar.

Abstract

Objectives HIV testing is an effective intervention for reducing HIV risk and providing information on HIV status. However, uptake of HIV testing is a major challenge within the drug-using population due to their illegal drug use behaviors. This study aimed to identify factors associated with HIV testing among injecting (IDUs) and non-injecting drug users (NIDUs) in Lashio, Myanmar.

Methods A cross-sectional study was conducted from January to February 2010. In total, 158 male IDUs and 210 male NIDUs were recruited using a respondent-driven sampling method. A multivariate analysis was performed separately for IDUs and NIDUs.

Results Approximately 77% of IDUs and 46% of NIDUs were ever tested for HIV. The multivariate analysis revealed that having ever received drug treatment was positively

associated with HIV testing among both IDUs (adjusted odds ratio [AOR] 13.07; 95% confidence interval [CI]: 3.38-50.53) and NIDUs (AOR 3.58; 95%CI: 1.38-9.24). IDUs who were married (AOR 0.24; 95%CI: 0.06-0.94) and who injected twice daily (AOR 0.30; 95%CI: 0.09-0.97) were less likely to test for HIV. Among NIDUs, those who belonged to Shan (AOR 0.30; 95%CI: 0.11-0.84) or Kachin (AOR 0.30; 95%CI: 0.10-0.87) ethnicities were less likely to test for HIV.

Conclusions In this study, more IDUs underwent HIV testing than did NIDUs. Those who had ever received drug treatment were more likely to test for HIV in both IDUs and NIDUs. Integrating HIV testing into drug treatment and expanding drug treatment may be effective to increase HIV testing uptake among both IDUs and NIDUs in Myanmar.

Key words: HIV, drug users, diagnosis, Myanmar

Introduction

Myanmar is one of the countries hardest hit by the HIV epidemic in South-East Asia. According to UNAIDS, approximately 240,000 people were living with HIV/AIDS and HIV prevalence was 0.5% among the adult population in Myanmar at the end of 2011.[1] Injecting drug use is a primary mode of HIV transmission in the country. The estimated number of drug users in 2008 was 300,000-400,000, of whom 90,000-150,000 were injecting drug users (IDUs). [2 3] HIV prevalence among IDUs was 21.9 % in 2011.[1] To tackle this problem, Myanmar has actively promoted condom use, improved the

management of sexually transmitted infections (STIs), and made access to HIV testing and counseling services widespread.

HIV testing is a highly cost-effective intervention for HIV risk reduction and transmission.[4] Early detection of HIV infection in individuals is essential to provide HIV-related support, care, and treatment, and to prevent further spread of infection. In addition, HIV testing and counseling can increase knowledge of HIV/AIDS, reduce risky sexual and drug use behaviors, and prevent other STIs. [5-9] It is therefore important to encourage IDUs and non-injecting drug users (NIDUs) to be tested for HIV infection.

In Myanmar, both the government and international non-governmental organizations (INGOs) are providing a variety of HIV testing services including referrals and pre- and post-test counseling.[10] By the end of 2006, 289 service delivery points were providing HIV testing services in Myanmar – 53% implemented through the government sector, and 47% through INGOs.[11] However, HIV testing uptake has been a major challenge within the drug using populations. Due to varying levels of stigma and discrimination associated with drug use and its illegality, access to mainstream public health services is often limited in the drug using population.[12]

In Myanmar, however, only limited information is available on the characteristics of both IDUs and NIDUs undergoing HIV testing. Therefore, the purpose

of this study was to identify the characteristics of IDUs and NIDUs who underwent HIV testing and to identify factors associated with testing uptake in Lashio Township, Northern Shan State, Myanmar.

Methods

Study design and area

A cross-sectional study was conducted in Lashio city, Northern Shan State of Myanmar, a small hill-town located close to the Chinese border. Data were collected in January and February 2010. Lashio is one of the priority townships in Myanmar that has been recommended for HIV interventions due to the high HIV prevalence among IDUs. IDUs' HIV prevalence in Lashio was 48.5 % in 2007,[13] while that among NIDUs was not available in Myanmar.

Study Participants

In this study, IDUs were defined as individuals who have visible signs of injection and/or who injected drugs in the past 6 months. NIDUs were defined as those with no history of injecting drug use and those who used drugs by a non-injecting route in the past 6 months. Study participants were recruited using the following criteria: 1) male IDUs and NIDUs, 2) aged 18 years or older, 3) had used drugs in the last 6 months, 4) not suffering from a serious drug dependency and 5) able to speak Myanmar language.

A total of 176 IDUs and 217 NIDUs were enrolled in this study. Of them, 18 IDUs and 7 NIDUs were excluded from analysis because of incomplete responses. The remaining participants, 158 IDUs and 210 NIDUs, were included in the present data analysis.

Sampling method

A respondent-driven sampling (RDS) method was used to recruit a participant that is an effective method to reach hidden population.[14] It uses dual incentives and a structured coupon disbursement process of "peer referral" to reduce typical flaws inherent in sampling of hidden populations' related biases. The first respondent was recruited from the pool of service-recipients at a local drop-in center. That successfully recruited participant was then provided with three coupons with serial numbers and instructions for passing those coupons to peers who were using drugs currently. Coupons were given a 2-weeks expiration date. The second respondent was also recruited in the same way.

All respondents recruited in this manner received an Information, Education and Communication (IEC) pack that included 2 condoms with gel packs along with an incentive of 2000 Kyats (US$ 2.5) as compensation for their time and travel. Respondents were eligible to receive a secondary incentive if recruits referred through

them showed up at study sites to participate within the expiry period of their recruitment coupons. The secondary incentive was 500 kyats (0.5$) per recruitment.

Measures

The dependent variable was ever tested HIV. HIV testing behaviors' variables included ever undergone an HIV test, HIV test frequency, date of HIV testing, and site of HIV testing. The independent variables were socio-demographic characteristic, drug use, sexual, HIV testing behaviors, and health service utilization behaviors of the participants.[13 15]

The contents of the study questions were adapted from several different studies in Myanmar. The socio-demographic characteristics, drug use behavior and health services utilization questions were adapted from the Rapid Assessment and Response on Drug Use and from the HIV Survey of the Asian Harm Reduction Network, Myanmar.[15] Sexual behaviors and HIV testing behavior questions were adapted from the Behavioral Surveillance Survey (BSS) Questionnaire of the Ministry of Health, Myanmar.[13] Pre-testing of the full questionnaire used in this study was done in Lashio with 20 IDUs and 20 NIDUs before data collection.

Data collection

After obtaining written informed consent from each participant, the lead researcher and six trained interviewers conducted interviews for data collection. They interviewed the participants for 30-40 minutes for each in a private setting. Most interviews were conducted at a local drop-in center (DIC). The lead researcher and trained interviewers went to the field to recruit participants who were willing to participate in this study without coming to a DIC.

Data analysis

Data were coded and entered using the Statistical Package for the Social Sciences (SPSS) version 16 (SPSS Inc., Chicago, IL, USA) for all analyses. Data analysis was carried out separately for IDUs and NIDUs. Descriptive statistics and χ^2 tests were used to compare background characteristics of the participants. Bivariate analyses were initially conducted to examine factors associated with HIV testing. Finally, all the covariates simultaneously entered into multiple regression model to calculate adjusted odds ratios (AORs), 95% confidence intervals (CIs), and corresponding *P*-values.

Ethical considerations

This study was approved by the Research Ethics Committee of the Graduate School of Medicine, the University of Tokyo, Japan and the Institutional Ethical Review

Committee, Department of Medical Research (Lower Myanmar), Ministry of Health, Yangon, Myanmar. The objectives of the study were made clear to respondents before their voluntary participation and individual written informed consent was obtained from all participants. Each participant was allowed to withdraw from the study at any time. Confidentiality of the entire data set was maintained at all stages of data collection and analyses.

Results

Socio-demographic and drug use characteristics

Table 1 presents socio-demographic characteristics of the IDUs and NIDUs. Of the 368 respondents, 158 participants were IDUs and 210 participants were NIDUs. The mean age was significantly different between IDUs and NIDUs; 29.8 (SD 6.7) years for IDUs and 25.5 (SD 5.8) years for NIDUs ($P < 0.001$). Among IDUs, 48.7% were between 21-30 years and 31.6% were between 31-40 years of age. Of the NIDUs, 63.8% were between 21-30 years and 14.3% were between 31-40 years. With regard to education levels, about a third of IDUs and NIDUs had primary or no formal education. Overall, 12.7% of IDUs and a significantly higher percentage of NIDUs (31.9%) had migrated to Lashio from another part of Myanmar ($P <0.001$).

Factors associated with HIV testing among injecting drug users (Table 2)

In total, 76.6 % of IDUs had ever tested for HIV. Bivariate analysis showed that those belonging to the older age group (odd ratio [OR] 2.57; 95% confidence interval [CI]: 1.17-5.66) and those who had a regular job (OR 2.91; 95% CI: 1.26-6.70) were more likely to have tested for HIV. Conversely, IDUs who practiced risky behaviors such as using more than two kinds of drugs (poly drugs) (OR 0.40; 95% CI: 0.18-0.85) and injecting drugs more than twice per day (OR 0.41; 95% CI: 0.19-0.88) were less likely to have tested for HIV. Participants who had ever received drug treatment (OR 14.57; 95% CI: 5.82-36.47), who had ever registered as a drug user (OR 5.33; 2.25-12.62), and who perceived themselves as being at risk of HIV infection (OR 3.57; 95% CI: 1.51-8.43) were significantly more likely to have tested for HIV.

The multiple regression model for IDUs indicated that those who were married (AOR 0.24; 95% CI: 0.06-0.94) and injected drugs twice daily (AOR 0.30; 95% CI: 0.09-0.97) were less likely to have tested for HIV. Meanwhile, IDUs having a regular job (AOR 4.50; 95% CI: 1.08-23.17), who had received drug treatment (AOR 13.07; 95% CI: 3.38-50.53), and perceived themselves as being at risk of HIV (AOR 5.70; 95% CI: 1.40-23.25) were more likely to have undergone HIV testing.

Factors associated with HIV testing among non-injecting drug users (Table 3)

Nearly half of NIDUs (45.7%) had ever tested for HIV. Being of Shan (OR 0.28; 95%

CI: 0.12-0.62) or Kachin (OR 0.21; 95% CI: 0.09-0.49) ethnicity, reporting poly drug use (OR 0.40; 95% CI: 0.21-0.74), and having visited a female sex worker within the last 3 months (OR 0.50; 95% CI: 0.29-0.88) were negatively associated with HIV testing. Conversely, NIDUs who had ever received drug treatment (OR 2.73; 95% CI: 1.51-4.92), had ever registered as a drug user (OR 3.48; 95% CI: 1.61-7.49), and who perceived themselves at being at risk of HIV infection (OR 3.29; 95% CI: 1.86-5.83) were more likely to have tested for HIV.

In the multiple regression model for NIDUs, individuals who were of Shan (AOR 0.30; 95% CI: 0.11-0.84) or Kachin (AOR 0.30; 95% CI: 0.10-0.87) ethnicity and who reported poly drug use within the last three months (AOR 0.33; 95% CI: 0.14-0.77) were less likely to have tested for HIV. Similar results as were observed among IDUs were observed among NIDUs, too. NIDUs who had ever received drug treatment (AOR 3.58; 95% CI: 1.38-9.24), ever registered as a drug user (AOR 4.38; 95% CI: 1.31-14.65), and who perceived themselves as at risk of HIV (AOR 4.46; 95% CI: 2.06-9.65) were more likely to have tested for HIV.

Discussion

This is the first study to identify the factors associated with HIV testing uptake among

IDUs and NIDUs in Lashio, where HIV prevalence among IDUs was one of the highest in Myanmar.[13] IDUs' HIV testing rate was higher compared to that of NIDUs' where harm reduction programs were implemented, especially where such programs targeted IDUs. Among IDUs, 76.6% had ever tested for HIV, while 45.7% of NIDUs had ever tested for HIV. These percentages are much higher compared to one-year testing rates reported among Italian drug users: 37.4% for IDUs and 28% for NIDUs.[16]

HIV testing was positively associated with ever received drug treatment and perception of personal risk of HIV infection among both IDUs and NIDUs. IDUs who had a regular job at the time of survey were also more likely to have undergone HIV testing. Married IDUs and IDUs who injected more than twice daily, meanwhile, were less likely to have undergone HIV testing. Among NIDUs, those who had ever registered as a drug user were more likely to have undergone HIV testing. NIDUs of Shan or Kachin ethnicity and who reported poly drug use within the last three months were less likely to have undergone HIV testing.

Notably, both IDUs and NIDUs who had ever received drug treatment were more likely to have been tested for HIV. In Vietnam, female sex workers who spent time in a rehabilitation center were more likely to have tested for HIV.[17] Also in Italy, IDUs who had ever received both pharmacological and psychological treatments were more

likely to have tested for HIV than were those who underwent only one kind of treatment.[16]

Drug treatment is playing an important role to reduce risk of HIV infection among both drug users.[18] However, HIV testing is not currently a compulsory service at drug treatment centers in Myanmar unless a drug user undergoing detoxification requests it. Since HIV testing and counseling effectively reduce risk behaviors in drug using populations, the United States Centers for Disease Control and Prevention recommends that HIV testing should be integrated into drug treatment services.[18] Expanding drug treatment to incorporate HIV testing services may increase the number of IDUs and NIDUs accessing HIV testing services in Myanmar, too.

Within both types of drug users, those who had engaged in risk behaviors were less likely to have tested for HIV. Both IDUs who injected twice daily and NIDUs who used more than two drugs (poly drug use) were less likely to have been tested for HIV. It is not surprising that the drug users are more prone to feeling afraid of receiving HIV testing results due to their risky behaviors.[19]

In this study, perceived risk of HIV infection was a significant predictor for HIV testing among both drug users. They may perceive themselves as at risk of HIV infection because they learn their partner's HIV status [20] or may weigh the implications

of their risky drugs use and sexual behaviors.[21] In this study, we did not confirm participants' HIV status due to ethical considerations. Regardless of HIV status and risk behaviors, perceived risk of HIV infection is a self-protective behavior which can motivate individuals to practice safer behaviors.

This study showed that IDUs who had a regular job were more likely to have been tested for HIV infection. The possible reason for this is that Myanmar National AIDS Programs included workplace as a priority setting for HIV/AIDS intervention/prevention program.[22] Thus, IDUs who had a regular job have been tested for HIV infection through those programs. On the other hand, conflicting findings found among Russian IDUs [23] and tuberculosis patients from Uganda [24] and Ethiopia. [25] In these studies, unemployed or part-time workers were more likely to test for HIV than employed or full time workers.

In the present study, married IDUs were less likely to have been tested for HIV than single IDUs. This is an important finding since two-fifths of all new HIV infections in Myanmar occurred through husband-to-wife transmission in 2010 and the trend of husband-to-wife transmission is estimated to increase to nearly half of all new infections among women by 2015.[26] HIV testing programs urgently need to focus on encouraging married IDUs to undergo HIV testing. In China, too, married men who

have sex with men (MSM) were less likely to have been tested for HIV. [27]

NIDUs who registered as drug users in the Government facilities were more likely to have been tested for HIV. Encouraging drug users to register as drug users may be effective to increase the uptake of HIV testing services among NIDUs. Nevertheless, most of the drug users were reluctant to register as a drug user due to several barriers, including stigma toward drug addicts, financial problems[28], fear of being known as a drug user, perceived low efficacy of available treatment, and the possibility of losing employment opportunities.[29 30]

Another important finding was that NIDUs who were of Shan or Kachin ethnicities were less likely to have tested their HIV status than were those of Burma ethnicity. It may be because most of the IEC materials, HIV testing information, and HIV counseling services were conducted in Myanmar language, which Shan and Kachin ethnicities were not always familiar with. Participants who do not speak or read Myanmar language may have had difficulty in accessing HIV testing services. If HIV testing services were offered in other languages for minorities such as Shan and Kachin, they would be better able to make use of those services.

Our findings are derived from a cross-sectional study, and several possible limitations of these findings should be noted. First, HIV testing was self-reported by

drug users, and we were not able to confirm their HIV status. Second, our results may not be generalized to drug users in other cities, as both IDUs and NIDUs from other parts of Myanmar may have different characteristics than those in Lashio. Despite these potential limitations, these results present the first look at HIV testing behaviors among drug users in Lashio, the famous border trade city with a high burden of HIV infection. Further research is needed to understand barriers and decisions to access HIV testing among drug users especially for those who are married and engaged in risk behaviors.

Conclusions

Both IDUs and NIDUs who had ever received drug treatment were more likely to have tested for HIV. More IDUs received HIV testing compared to NIDUs. Low HIV testing rates were found among IDUs who were married and who injected twice per day and among NIDUs reporting poly drug use within the last three months and who were of Kachin or Shan ethnicity. To increase HIV testing rate especially among NIDUs, we need to encourage them to register as a drug users and providing them with HIV services in Myanmar language as well as in ethnic languages. Integrating HIV testing into drug treatment and expanding drug treatment services is an effective way to increase utilization of HIV testing among both types of drug users in Myanmar.

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Competing interests:

None.

Ethical approval

The study was approved by the Research Ethics Committee of the Graduate School of Medicine, the University of Tokyo, Japan and the Institutional Ethical Review Committee, Department of Medical Research (Lower Myanmar), Ministry of Health, Yangon, Myanmar.

Provenance and peer review

Not commissioned; externally peer reviewed.

Data sharing statement

Extra data are available from the corresponding author.

Contributing authors:

Yu Mon Saw and Junko Yasuoka participated in the design of the study, conducted the statistical analyses, and drafted the article. Krishna C. Poudel participated in the analysis and the interpreted the results. Yu Mon Saw, Thu Nandar Saw and Soe Tun oversaw the implementation of study. Masamine Jimba supervised the study and the revisions to the article. All authors contributed to the writing of the manuscript and approved the final manuscript.

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Table.1 Socio-demographic characteristics of participants (N=368)

Characteristics	Injecting drug user (n=158)		Non-injecting drug user (n=210)		P-vaule
	n/mean	%/SD	n/mean	%/SD	
Age	***29.8***	***7.2***	***25.5***	***5.8***	<0.001
<=20	17	(10.8)	40	(19.0)	
21-30	77	(48.7)	134	(63.8)	
31-40	50	(31.6)	30	(14.3)	
41-50	14	(8.9)	6	(2.9)	
Ethnicity					0.943
Burma	35	(22.2)	45	(21.4)	
Shan	46	(29.1)	66	(31.4)	
Kachin	35	(22.2)	48	(22.9)	
Others	42	(26.5)	51	(24.3)	
Marital status					0.137
Single	75	(47.5)	110	(52.4)	
Married	66	(41.8)	68	(32.4)	
Divorced/Widower/Seperated	17	(10.7)	32	(15.2)	
Education					0.227
Primary/No formal education	52	(32.9)	61	(29.0)	
Secondary education	58	(36.7)	67	(31.9)	
High school and higher education	48	(30.4)	82	(39.0)	
Employment status					0.315
Non-regular job	32	(20.3)	34	(16.2)	
Regular job	126	(79.7)	176	(83.8)	
Living status (Inter-regional migration)					<0.001
Resident	138	(87.3)	143	(68.1)	
Migrant	20	(12.7)	67	(31.9)	

Mean age 29.8 (SD 7.2) for IDUs and 25.5 (SD 25.5) for NIDUs

Table 2. Factors associated with HIV testing among injecting drug user in Lashio,Myanmar (N=158)

	N	%	OR	95%CI	AOR	95%CI
Age						
≤ 29	68	43.0				
> 29	90	57.0	2.57	1.17-5.66*	2.06	0.63-6.76
Marital status						
Single	75	47.4				
Married	66	41.8	0.61	0.28-1.35	0.24	0.06-0.94*
Divorced/Widower	17	10.8	0.55	0.17-1.82	0.26	0.04-1.94
Education						
Primary/No formal education	61	29.0				
Secondary education	67	31.9	1.57	0.64-3.86	2.59	0.63-10.60
High school or above	82	39.1	1.11	0.45-2.71	1.82	0.29-4.86
Ethnicity						
Burma	35	22.2				
Shan	46	29.0	0.93	0.27-3.22	2.15	0.32-14.57
Kachin	35	22.2	0.22	0.07-0.71*	0.58	0.11-2.94
Others	42	26.6	0.53	0.16-1.74	0.83	0.16-4.27
Employment status						
Non-regular job	32	20.3				
Regular job	126	79.7	2.91	1.26-6.70*	4.50	1.08-23.17*
Living status (Inter-regional migration)						
Migrant	20	12.7				
Resident	138	87.3	0.80	0.25-2.55	0.81	0.14-4.81
Most used drug type in the past 3 months						
Heroin	156	98.7	S/S		S/S	
Stimulant and others	2	1.3				
Had history of poly drug use in the past 3 months						
Never	83	52.5				
Ever	75	47.5	0.40	0.18-0.85*	0.44	0.14-1.43
Had history of unsafe injection practice in the past 3 months						
No	107	52.5				
Yes	51	47.5	1.72	0.76-3.86	1.01	0.27-3.84
Frequency of injection per day						
≤ 2	86	54.4				
> 2	72	45.6	0.41	0.19-0.88*	0.30	0.09-0.97*
Had history of FSW visit in the past 3 months						
Never	73	46.2				
Ever	85	53.8	0.74	0.35-1.56	1.34	0.25-7.12
Sexual orientation						
Hetero-sexual	135	85.4				
Bi/Homo-sexual	23	14.6	0.21	0.08-0.53**	0.61	0.13-2.84
Had more than one partners in the past 3 months						
No	73	46.2				
Yes	85	53.8	0.40	0.18-0.89*	0.20	0.04-1.11
Ever received drug treatment						
No	31	19.6				
Yes	127	80.4	14.57	5.82-36.47**	13.07	3.38-50.53***
Ever register as a drug user						
No	78	49.4				
Yes	80	50.6	5.33	2.25-12.62**	2.21	0.57-8.63
Ever been in prison or jail						
No	106	67.1				
Yes	52	32.9	0.56	0.26-1.19	0.44	0.10-1.84
Perceived HIV risk						
No	90	57.0				
Yes	68	43.9	3.57	1.51-8.43**	5.70	1.40-23.25*

Note. OR: odd Ratio;CI: confidence interval; AOR: adjusted odd ratio; FSW: female sex worker

* p <0.05;** p <0.01; *** p <0.001; S/S=small sample size

Table 3. Factors associated with HIV testing among non- injecting drug user in Lashio,Myanmar (N= 210)

	N	%	OR	95%CI	AOR	95%CI
Age						
≤ 25	116	55.2				
> 25	94	44.8	1.17	0.68-2.02	0.75	0.33-1.71
Marital status						
Single	110	52.4				
Married	68	32.4	0.62	0.33-1.15	0.52	0.22-1.21
Divorced/Widower	32	15.2	0.88	0.40-1.94	0.39	0.13-1.18
Education						
Primary/No formal education	52	32.9				
Secondary education	58	36.7	2.04	1.01-4.13	2.38	0.95-5.97
High school or above	48	30.4	1.29	0.66-2.55	1.48	0.58-3.77
Ethnicity						
Burma	45	21.4				
Shan	66	31.4	0.28	0.12-0.62*	0.30	0.11-0.84*
Kachin	48	22.9	0.21	0.09-0.49**	0.30	0.10-0.87*
Others	51	24.3	0.43	0.19-1.00	0.52	0.18-1.49
Employment status						
Non-regular job	34	16.2				
Regular job	176	83.8	1.67	0.78-3.59	1.35	0.44-4.14
Living status (Inter-regional migration)						
Migrant	67	31.9				
Resident	143	68.1	0.52	0.29-0.94*	0.55	0.26-1.17
Most used drug type in the past 3 months						
Heroin	87	41.4				
Stimulant and others	123	58.6	1.15	0.66-2.00	1.54	0.63-3.79
Had history of poly drug use in the past 3 months						
Never	58	27.6				
Ever	152	72.4	0.40	0.21-0.74*	0.33	0.14-0.77**
Had history of FSW visit in the past 3 months						
Never	80	38.1				
Ever	130	61.9	0.50	0.29-0.88*	0.63	0.30-1.33
Sexual orientation						
Hetero-sexual	76	36.2				
Bi/Homo-sexual	134	63.8	1.77	0.99-3.14	1.72	0.73-4.03
Had more than one partners in the past 3 months						
No	35	16.7				
Yes	175	83.3	0.87	0.42-1.80	0.80	0.27-2.38
Ever received drug treatment	139	66.2				
No	71	33.8	2.73	1.51-4.92**	3.58	1.38-9.24**
Yes						
Ever register as a drug user						
No	173	82.4				
Yes	37	17.6	3.48	1.61-7.49**	4.38	1.31-14.65**
Ever been in prison or jail						
No	174	82.9				
Yes	36	17.1	1.08	0.52-2.21	1.28	0.35-4.65
Perceived HIV risk						
No	120	57.1				
Yes	90	42.9	3.29	1.86-5.83*	4.46	2.06-9.65***

Note. OR: odd Ratio;CI: confidence interval; AOR: adjusted odd ratio; FSW: female sex worker

* p <0.05;** p <0.01; *** p <0.001; S/S=small sample size

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	**(*a*) Indicate the study's design with a commonly used term in the title or the abstract** A cross-sectional study that indentified factors associated with HIV testing among injecting (IDU) and non-injecting drug users (NIDUs).	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found HIV testing is an effective intervention for reducing HIV risk. However, uptake of HIV testing is a major challenge within the drug-using population due to their illegal drug use behaviours. This study aimed to identify factors associated with HIV testing among IDUs and NIDUs in Lashio, Myanmar. A cross-sectional study was conducted from January to February 2010. In total, 158 male IDUs and 210 male NIDUs were recruited using a respondent-driven sampling method. A multivariate analysis was performed separately for IDUs and NIDUs. In this study, more IDUs underwent HIV testing than did NIDUs. The multivariate analysis revealed that having ever received drug treatment was positively associated with HIV testing among both IDUs and NIDUs. Integrating HIV testing into drug treatment and expanding drug treatment may be effective to increase HIV testing uptake among both IDUs and NIDUs in Myanmar.	1
Introduction			
Background/rationale	2	**Explain the scientific background and rationale for the investigation being reported** Myanmar is one of the countries hardest hit by the HIV epidemic in South-East Asia. Injecting drug use is a primary mode of HIV transmission in the country. The estimated number of drug users in 2008 was 300,000-400,000, of whom 90,000-150,000 were injecting drug users (IDUs). HIV prevalence among IDUs was 21.9 % in 2011 (NAP/Myanmar, 2012). HIV testing is a highly cost-effective intervention for HIV risk reduction and transmission to the general population. Early detection of HIV infection in individuals is essential to provide HIV-related support, care, and treatment, and to prevent further spread of infection. In addition, HIV testing and counseling can increase knowledge of HIV/AIDS, reduce risky sexual and drug use behaviors, and prevent other STIs. It is therefore important to encourage IDUs and non-injecting drug users (NIDUs) to be tested for HIV infection due to their risk behaviors. However, HIV testing uptake has been a major challenge within the drug using populations. Due to varying levels of stigma and discrimination associated with drug use and its illegality, access to mainstream public health services is often limited in the drug using population. In Myanmar, however, only limited information is available on the characteristics of drug users undergoing HIV testing.	3 to 4
Objectives	3	**State specific objectives, including any prespecified hypotheses** The purpose of this study was to identify the characteristics of IDUs and NIDUs who underwent HIV testing and to identify factors associated with testing uptake in Lashio Township, Northern Shan State, Myanmar. We hypothesized NIDUs tested	4

		HIV than IDUs.	
Methods			
Study design	4	**Present key elements of study design early in the paper** A cross-sectional study	4
Setting	5	**Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection** The study was conducted in Lashio city, Northern Shan State of Myanmar, a small hill-town located close to the Chinese border. Lashio is one of the priority townships in Myanmar that has been recommended for HIV interventions due to the high HIV prevalence among IDUs. IDUs' HIV prevalence in Lashio was 48.5 % in 2007, while that among NIDUs was not available in Myanmar. Data were collected in January and February 2010 using respondent-driven sampling (RDS) method . After obtaining written informed consent from each participant, the lead researcher and six trained interviewers conducted interviews for data collection. They interviewed the participants for 30-40 minutes for each in a private setting. Most interviews were conducted at a local drop-in center (DIC). The lead researcher and trained interviewers went to the field to recruit participants who were willing to participate in this study without coming to a DIC.	5 to 7
Participants	6	**(*a*) Give the eligibility criteria, and the sources and methods of selection of participants** In this study, IDUs were defined as individuals who have visible signs of injection and/or who injected drugs in the past 6 months. NIDUs were defined as those with no history of injecting drug use and those who used drugs by a non-injecting route in the past 6 months. Study participants were recruited using the following criteria: 1) male IDUs and NIDUs, 2) aged 18 years or older, 3) had used drugs in the last 6 months, 4) not suffering from a serious drug dependency and 5) able to speak Myanmar language. A respondent-driven sampling (RDS) method was used to recruit a participant that is an effective method to reach hidden population. The first respondent was recruited from the pool of service-recipients at a local drop-in center. That successfully recruited participant was then provided with three coupons with serial numbers and instructions for passing those coupons to peers who were using drugs currently. Coupons were given a 2-weeks expiration date. The second respondent was also recruited in the same way. All respondents recruited in this manner received an Information, Education and Communication (IEC) pack that included 2 condoms with gel packs along with an incentive of 2000 Kyats (US$ 2.5) as compensation for their time and travel. Respondents were eligible to receive a secondary incentive if recruits referred through them showed up at study sites to participate within the expiry period of their recruitment coupons. The secondary incentive was 500 kyats (0.5$) per recruitment.	5 to 6
Variables	7	**Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable** The outcome variable was ever tested HIV. The exposure variables included socio-demographic characteristic, drug use, sexual, HIV testing behaviors, and health service utilization behaviors of the participants. The contents of the study	6 to 7

		questions were adapted from several different studies in Myanmar.	
Data sources/ measurement	8*	**For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group** The socio-demographic characteristics, drug use behavior and health services utilization questions were adapted from the Rapid Assessment and Response on Drug Use and from the HIV Survey of the Asian Harm Reduction Network, Myanmar . Sexual behaviors and HIV testing behavior questions were adapted from the Behavioral Surveillance Survey (BSS) Questionnaire of the Ministry of Health, Myanmar. Pre-testing of the full questionnaire used in this study was done in Lashio with 20 IDUs and 20 NIDUs before data collection.	7
Bias	9	**Describe any efforts to address potential sources of bias** HIV testing was self-reported by drug users, and we were not able to confirm their HIV status.	16
Study size	10	**Explain how the study size was arrived at** Using RSD method, a total of 176 IDUs and 217 NIDUs were enrolled in this study. Of them, 18 IDUs and 7 NIDUs were excluded from analysis because of incomplete responses. The remaining participants, 158 IDUs and 210 NIDUs, were included in the present data analysis.	5
Quantitative variables	11	**Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why** Data were coded and entered using the Statistical Package for the Social Sciences (SPSS) version 16 (SPSS Inc., Chicago, IL, USA) for all analyses. Data analysis was carried out separately for IDUs and NIDUs.	8
Statistical methods	12	**(*a*) Describe all statistical methods, including those used to control for confounding** Descriptive statistics and χ^2 tests were used to compare background characteristics of the participants. Bivariate analyses were initially conducted to examine factors associated with HIV testing. Finally, multivariate logistic regression was performed to calculate adjusted odds ratios (AORs), 95% confidence intervals (CIs), and corresponding *P*-values.	8
		(*b*) Describe any methods used to examine subgroups and interaction Not applicable	
		(*c*) Explain how missing data were addressed 18 IDUs and 7 NIDUs were excluded from analysis because of incomplete responses. The remaining participants, 158 IDUs and 210 NIDUs, were included in the present data analysis.	5
		(*d*) If applicable, describe analytical methods taking account of sampling strategy Not applicable	
		(*e*) Describe any sensitivity analyses	

		Not applicable	
Results			
Participants	13*	**(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed** 176 IDUs and 217 NIDUs were recruited in this study. Due to incomplete responses, 18 IDUs and 7 NIDUs were excluded from analysis.	5
		(b) Give reasons for non-participation at each stage Not applicable	
		(c) Consider use of a flow diagram Not applicable	
Descriptive data	14*	**(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders** The socio-demographic characteristics of the IDUs and NIDUs. Of the 368 respondents, 158 participants were IDUs and 210 participants were NIDUs. The mean age was significantly different between IDUs and NIDUs; 29.8 (SD 6.7) years for IDUs and 25.5 (SD 5.8) years for NIDUs (P < 0.001). Among IDUs, 48.7% were between 21-30 years and 31.6% were between 31-40 years of age. Of the NIDUs, 63.8% were between 21-30 years and 14.3% were between 31-40 years. With regard to education levels, about a third of IDUs and NIDUs had primary or no formal education. Overall, 12.7% of IDUs and a significantly higher percentage of NIDUs (31.9%) had migrated to Lashio from another part of Myanmar (P <0.001).	9
		(b) Indicate number of participants with missing data for each variable of interest Not applicable	
Outcome data	15*	**Report numbers of outcome events or summary measures** In total, 76.6% of IDUs and 45.7% of NIDUs were ever tested for HIV.	9 to 10
Main results	16	**(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included** **IDUs model** Bivariate analysis showed that those belonging to the older age group (odd ratio [OR] 2.57; 95% confidence interval [CI]: 1.17-5.66) and those who had a regular job (OR 2.91; 95% CI: 1.26-6.70) were more likely to have tested for HIV. Conversely, IDUs who practiced risky behaviors such as using more than two kinds of drugs (poly drugs) (OR 0.40; 95% CI: 0.18-0.85) and injecting drugs more than twice per day (OR 0.41; 95% CI: 0.19-0.88) were less likely to have tested for HIV. Participants who had ever received drug treatment (OR 14.57; 95% CI: 5.82-36.47), who had ever registered as a drug user (OR 5.33; 2.25-12.62), and who perceived themselves as being at risk of HIV infection (OR 3.57; 95% CI: 1.51-8.43) were	9 to 11

		significantly more likely to have tested for HIV. The multivariate model for IDUs indicated that those who were married (AOR 0.24; 95% CI: 0.06-0.94) and injected drugs twice daily (AOR 0.30; 95% CI: 0.09-0.97) were less likely to have tested for HIV. Meanwhile, IDUs having a regular job (AOR 4.50; 95% CI: 1.08-23.17), who had received drug treatment (AOR 13.07; 95% CI: 3.38-50.53), and perceived themselves as being at risk of HIV (AOR 5.70; 95% CI: 1.40-23.25) were more likely to have undergone HIV testing. **NIDUs model** Nearly half of NIDUs (45.7%) had ever tested for HIV. Being of Shan (OR 0.28; 95% CI: 0.12-0.62) or Kachin (OR 0.21; 95% CI: 0.09-0.49) ethnicity, reporting poly drug use (OR 0.40; 95% CI: 0.21-0.74), and having visited a female sex worker within the last 3 months (OR 0.50; 95% CI: 0.29-0.88) were negatively associated with HIV testing. Conversely, NIDUs who had ever received drug treatment (OR 2.73; 95% CI: 1.51-4.92), had ever registered as a drug user (OR 3.48; 95% CI: 1.61-7.49), and who perceived themselves at being at risk of HIV infection (OR 3.29; 95% CI: 1.86-5.83) were more likely to have tested for HIV. In the multivariate model for NIDUs, individuals who were of Shan (AOR 0.30; 95% CI: 0.11-0.84) or Kachin (AOR 0.30; 95% CI: 0.10-0.87) ethnicity and who reported poly drug use within the last three months (AOR 0.33; 95% CI: 0.14-0.77) were less likely to have tested for HIV. Similar results as were observed among IDUs were observed among NIDUs, too. NIDUs who had ever received drug treatment (AOR 3.58; 95% CI: 1.38-9.24), ever registered as a drug user (AOR 4.38; 95% CI: 1.31-14.65), and who perceived themselves as at risk of HIV (AOR 4.46; 95% CI: 2.06-9.65) were more likely to have tested for HIV. We included all variables in the multivariate model to see which factors were most influencing factors of uptake of HIV test analysis even though it was not significant in the bivariate analysis.	
		(*b*) Report category boundaries when continuous variables were categorized Mean age was used to categorize age variable.	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period Not applicable	
Other analyses	17	**Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses** Not applicable	
Discussion		This is the first study to identify the factors associated with HIV testing uptake among IDUs and NIDUs in Lashio, where HIV prevalence among IDUs was one of the highest in Myanmar (NAP/Myanmar, 2008). IDUs' HIV testing rate was higher compared to that of NIDUs' where harm reduction programs were implemented, especially where such programs targeted IDUs. Among IDUs, 76.6% had ever tested for HIV, while 45.7% of NIDUs had ever tested for HIV. These percentages are much higher compared to one-year testing rates reported among Italian drug users: 37.4% for IDUs and 28% for NIDUs (Camoni et al., 2011). HIV testing was positively associated with ever received drug treatment and perception of personal risk of HIV infection among both IDUs and NIDUs. IDUs who had a regular job at the time of survey were also more likely to have undergone HIV testing. Married IDUs and IDUs who injected more than twice daily, meanwhile, were less likely to have undergone HIV testing. Among NIDUs, those who had ever registered as a drug user were more likely to have undergone HIV testing. NIDUs of Shan or Kachin ethnicity and who reported poly drug use within the last three months	11 to 16

were less likely to have undergone HIV testing.

Notably, both IDUs and NIDUs who had ever received drug treatment were more likely to have been tested for HIV. In Vietnam, female sex workers who spent time in a rehabilitation center were more likely to have tested for HIV (Grayman et al., 2005). Also in Italy, IDUs who had ever received both pharmacological and psychological treatments were more likely to have tested for HIV than were those who underwent only one kind of treatment (Camoni et al., 2011). Drug treatment is playing an important role to reduce risk of HIV infection among both drug users (CDC, 2002). However, HIV testing is not currently a compulsory service at drug treatment centers in Myanmar unless a drug user undergoing detoxification requests it. Since HIV testing and counseling effectively reduce risk behaviors in drug using populations, the United States Centers for Disease Control and Prevention recommends that HIV testing should be integrated into drug treatment services (CDC, 2002). Expanding drug treatment to incorporate HIV testing services may increase the number of IDUs and NIDUs accessing HIV testing services in Myanmar, too.

Within both types of drug users, those who had engaged in risk behaviors were less likely to have tested for HIV. Both IDUs who injected twice daily and NIDUs who used more than two drugs (poly drug use) were less likely to have been tested for HIV. It is not surprising that the drug users are more prone to feeling afraid of receiving HIV testing results due to their risky behaviors (Spielberg, Kurth, Gorbach, & Goldbaum, 2001).

In this study, perceived risk of HIV infection was a significant predictor for HIV testing among both drug users. They may perceive themselves as at risk of HIV infection because they learn their partner's HIV status (Adih & Alexander, 1999) or may weigh the implications of their risky drugs use and sexual behaviors (Filipe et al., 2005). In this study, we did not confirm participants' HIV status due to ethical considerations. Regardless of HIV status and risk behaviors, perceived risk of HIV infection is a self-protective behavior which can motivate individuals to practice safer behaviors (Reisen & Poppen, 1999).

This study showed that IDUs who had a regular job were more likely to have been tested for HIV infection. The possible reason for this is that Myanmar National AIDS Programs included workplace as a priority setting for HIV/AIDS intervention/prevention program (NAP/Myanmar, 2010). Thus, IDUs who had a regular job have been tested for HIV infection through those programs. On the other hand, conflicting findings found among Russian IDUs (Niccolai et al., 2010) and tuberculosis patients from Uganda (Sendagire et al., 2010) and Ethiopia (Jerene, Endale, & Lindtjorn, 2007). In these studies, unemployed or part-time workers were more likely to test for HIV than employed or full time workers. In the present study, married IDUs were less likely to have been tested for HIV than single IDUs. This is an important finding since two-fifths of all new HIV infections in Myanmar occurred through husband-to-wife transmission in 2010 and the trend of husband-to-wife transmission is estimated to increase to nearly half of all new infections among women by 2015 (Myat, 2010). HIV testing programs urgently need to focus on encouraging married IDUs to undergo HIV testing. In China, too, married men who have sex with men (MSM) were less likely to have been tested for HIV (Wei et al., 2011).

NIDUs who registered as drug users in the Government facilities were more likely to have been tested for HIV. Encouraging drug users to register as drug users may be effective to increase the uptake of HIV testing services among NIDUs. Nevertheless, most of the drug users were reluctant to register as a drug user due to several barriers, including stigma toward drug addicts, financial problems (Appel, Ellison, Jansky, & Oldak, 2004), fear of being known as a drug user, perceived low efficacy of available treatment, and the possibility of losing employment opportunities (Bobrova et al., 2006; Tucker, 2001). Another important finding was that NIDUs who were of Shan or Kachin ethnicities were less likely to have tested their HIV status than were those of Burma ethnicity. It may be because most of the IEC materials, HIV testing

		information, and HIV counseling services were conducted in Myanmar language, which Shan and Kachin ethnicities were not always familiar with. Participants who do not speak or read Myanmar language may have had difficulty in accessing HIV testing services. If HIV testing services were offered in other languages for minorities such as Shan and Kachin, they would be better able to make use of those services.	
Key results	18	**Summarise key results with reference to study objectives** Both IDUs and NIDUs who had ever received drug treatment were more likely to have tested for HIV. More IDUs received HIV testing compared to NIDUs. Low HIV testing rates were found among IDUs who were married and who injected twice per day and among NIDUs reporting poly drug use within the last three months and who were of Kachin or Shan ethnicity. To increase HIV testing rate especially among NIDUs, we need to encourage them to register as a drug users and providing them with HIV services in Myanmar language as well as in ethnic languages. Integrating HIV testing into drug treatment and expanding drug treatment services is an effective way to increase utilization of HIV testing among both types of drug users in Myanmar.	16
Limitations	19	**Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias** Our findings are derived from a cross-sectional study, and several possible limitations of these findings should be noted. First, HIV testing was self-reported by drug users, and we were not able to confirm their HIV status. Second, the lack of indentified significant correlates of HIV testing may be due to insufficient sample size for the required statistical power or loss of information resulting from dichotomization of covariates. Despite these potential methodological limitations, these results present the first look at HIV testing behaviors among drug users in Lashio, the famous border trade city with a high burden of HIV infection. Further research is needed to understand barriers and decisions to access HIV testing among drug users especially for those who are married and engaged in risk behaviors.	16
Interpretation	20	**Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence** Results may need to be carefully interpreted as drug users from other cities from Myanmar may have different characteristics. However, IDUs who had ever received both pharmacological and psychological treatments were more likely to have tested for HIV than were those who underwent only one kind of treatment in Italy (Camoni et al., 2011) and female sex workers from Vietnam who spent time in a rehabilitation center were more likely to have tested for HIV (Grayman et al., 2005). Drug treatment is playing an important role to reduce risk of HIV infection among both drug users (CDC, 2002). However, HIV testing is not currently a compulsory service at drug treatment centers in Myanmar unless a drug user undergoing detoxification requests it. Since HIV testing and counseling effectively reduce risk behaviors in drug using populations, the United States Centers for Disease Control and Prevention recommends that HIV testing should be integrated into drug treatment services (CDC, 2002). Expanding drug treatment to incorporate HIV testing services may increase the number of IDUs and NIDUs accessing HIV testing services in Myanmar, too.	12 to 13
Generalisability	21	**Discuss the generalisability (external validity) of the study results** Our results may not be generalized to drug users in other cities, as both IDUs and NIDUs from other parts of Myanmar may have different characteristics than those in Lashio.	

Other information			
Funding	22	This study has received funding from the University of Tokyo and the ITO foundation (G 0114) of Tokyo.	17

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Factors associated with HIV testing among male injecting and non-injecting drug users in Lashio, Myanmar: A cross-sectional study

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Factors associated with HIV testing among male injecting and non-injecting drug users in Lashio, Myanmar: A cross-sectional study

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ARTICLE SUMMARY

Article focus

- To identify factors associated with HIV testing among injecting (IDUs) and non-injecting drug users (NIDUs) in Lashio, Myanmar

Key messages

- IDUs were more likely than NIDUs to have been tested for HIV.
- HIV testing rates were especially low among both IDUs and NIDUs engaging in risk behaviors.
- IDUs and NIDUs would benefit from integrating HIV testing services into drug treatment services.

Strengths and limitation of this study

- The first look at HIV testing that covered both IDUs and NIDUs
- Respondent driven Sampling was used to recruit participants.
- HIV testing was self-reported by drug users.
- Results may not be generalized to drug users in other cities of Myanmar.

Abstract

Objectives: HIV testing is an effective intervention for reducing HIV risk and providing information on HIV status. However, uptake of HIV testing is a major challenge within the drug-using population due to the stigma and discrimination associated with their illegal drug use behaviors. This study thus aimed to identify factors associated with HIV testing among injecting (IDUs) and non-injecting drug users (NIDUs) in Lashio, Myanmar.

Methods: A cross-sectional study was conducted from January to February 2010. In total, 158 male IDUs and 210 male NIDUs were recruited using a respondent-driven sampling method. Multivariate analysis was performed separately for IDUs and NIDUs.

Results: Approximately 77% of IDUs and 46% of NIDUs were ever tested for HIV. The multivariate analysis revealed that having ever received drug treatment was positively associated with HIV testing among both IDUs (adjusted odds ratio [AOR] 13.07; 95%

confidence interval [CI]: 3.38-50.53) and NIDUs (AOR 3.58; 95% CI: 1.38-9.24). IDUs who were married (AOR 0.24; 95% CI: 0.06-0.94) and who injected at least twice daily (AOR 0.30; 95%CI: 0.09-0.97) were less likely to undergo HIV testing. Among NIDUs, those who belonged to Shan (AOR 0.30; 95%CI: 0.11-0.84) or Kachin (AOR 0.30; 95%CI: 0.10-0.87) ethnicities were less likely to test for HIV.

Conclusions: IDUs and NIDUs who have received drug treatment are more likely to test for HIV. Integrating HIV testing into drug treatment programs alongside general expansion of HIV testing services may be effective to increase HIV testing uptake among both IDUs and NIDUs in the Northern Shan State of Myanmar.

Key words: HIV, drug users, diagnosis, Myanmar

Introduction

Myanmar is one of the countries hardest hit by the HIV epidemic in South-East Asia. According to the Joint United Nations Programme on AIDS (UNAIDS), approximately 240,000 people were living with HIV/AIDS at the end of 2011, and HIV prevalence was 0.5% within Myanmar's adult population.[1] Injecting drug use is a primary mode of HIV transmission in the country. The estimated number of drug users in 2008 was 300,000-400,000, of whom 90,000-150,000 were injecting drug users (IDUs). [2 3] HIV prevalence among IDUs was 21.9 % in 2011.[1] To tackle this problem, Myanmar has actively promoted condom use, improved the management of sexually transmitted infections (STIs), and made access to HIV testing and counseling services more widespread.

HIV testing is a highly cost-effective intervention for reduction of HIV risk and transmission.[4] Early discovery of HIV infection in individuals is essential to provide HIV-related care and treatment, and to prevent further spread of the disease to others. In addition, HIV testing and counseling can increase knowledge of HIV/AIDS, reduce risky sexual and drug use behaviors, and prevent other STIs. [5-9] It is therefore important to encourage IDUs and non-injecting drug users (NIDUs) to be tested for HIV infection.

In Myanmar, both the government and international non-governmental organizations (INGOs) have been providing a variety of HIV testing services including

referrals and pre- and post-test counseling.[10] By the end of 2006, 289 service delivery points were providing HIV testing services in Myanmar – 53% implemented through the government sector, and 47% through INGOs.[11] However, HIV testing uptake has been a major challenge within the drug using populations. Due to varying levels of stigma and discrimination associated with drug use and its illegality, access to mainstream public health services is often limited in the drug using population.[12] In Myanmar, drug treatment, including methadone maintenance treatment (MMT), is provided through government run medical facilities, and HIV testing is not a compulsory service in the treatment.

Despite the critical importance of these population sub-groups to HIV prevention and treatment efforts, only limited information is available on the characteristics of both IDUs and NIDUs undergoing HIV testing in Myanmar. Therefore, the purpose of this study was to identify the characteristics of IDUs and NIDUs undergoing HIV testing, and to identify factors associated with testing uptake in Lashio Township, Northern Shan State, Myanmar.

Methods

Study design and area

A cross-sectional study was conducted in Lashio city in the Northern Shan State of

Myanmar, a small hill-town located close to the Chinese border. Data were collected in January and February 2010. Lashio is one of the townships in Myanmar recommended as a priority focus for HIV interventions due to the high HIV prevalence among IDUs – 48.5 % in 2007.[13] Information on HIV prevalence among NIDUs, meanwhile, is not available in Myanmar.

Study Participants

In this study, IDUs were defined as individuals having visible signs of injection, as confirmed by medical personnel in a private setting, and/or who had injected drugs in the past 6 months. NIDUs were defined as those with no history of injecting drug use and those who had used drugs by a non-injecting route in the past 6 months. Study participants were recruited using the following criteria: 1) male IDU or NIDU, 2) aged 18 years or older, 3) had used drugs in the last 6 months, 4) exhibiting no withdrawal symptoms and not under the influence of drugs at the time of interview, and 5) able to speak the Myanmar language.

A total of 176 IDUs and 217 NIDUs were ultimately enrolled in the study. Of them, 18 IDUs and 7 NIDUs were excluded from analysis because of incomplete responses. The remaining participants, 158 IDUs and 210 NIDUs, were included in the data analysis.

Sampling method

A respondent-driven sampling (RDS) method was used to recruit participants as an approach generally regarded as effective for reaching hidden populations.[14] The method uses dual incentives and a structured coupon disbursement process of "peer referral" to reduce typical flaws and biases inherent in sampling of hidden populations'. The first-round respondents, also known as "seeds", were recruited from the pool of service-recipients at a local drop-in center (DIC). From three seeds (two IDUs and one NIDU) were recruited a total of 174 IDUs and 216 NIDUs (not including seeds) meeting the study criteria. The recruitment process did not distinguish between IDUs and NIDUs. Both IDUs and NIDUs were allowed to recruit any friends who used drugs by either means of administration. Distribution of coupons was terminated when the target sample size was attained. The successfully recruited participant was then provided with three coupons with serial numbers and instructions for passing those coupons to peers who were currently using drugs. Coupons were given a 2-week expiration date. The second respondent was also recruited in the same way.

All respondents recruited in this manner received an Information, Education and Communication (IEC) pack that included two condoms with gel packs along with an

incentive of 2000 Kyats (US$ 2.5) as compensation for their time and travel. Respondents were eligible to receive a secondary incentive if recruits referred through them showed up at study sites to participate within the expiration period designated on their recruitment coupons. The secondary incentive was 500 kyats (0.5$) per recruitment.

Measures

The dependent variable was ever experience of HIV testing. Specific HIV testing behavior-related variables included ever having undergone an HIV test, HIV testing frequency, date of last HIV testing, and site of last HIV testing. The independent variables were socio-demographic characteristics, drug use, sexual history, HIV testing behaviors, and health service utilization behaviors.[13 15] Assessed socio-demographic variables included age (IDUs: ≤29 years old vs. >29 years old; NIDUs: ≤25 years old vs. >25 years old), marital status (single vs. married vs. divorced/widowed), race/ethnicity (Burma vs. Shan vs. Kachin vs. Other), educational background (primary/ no formal education vs. secondary education vs. high school or above), employment (non-regular job vs. regular job), and Lashio residence status (migrant vs. resident).

Variables on drug use and sexual behaviors included type of illicit drug use, route of administration for drug use, frequency of injecting drug use, unsafe injecting

practice (receptive or distributive syringe sharing; yes vs. no), poly drug use (yes vs. no), disclosure of sexual orientation (hetero- vs. bi/homosexual), having more than one partner (yes vs. no), and history of female sex worker visit (yes vs. no). Variables regarding health services utilization included ever undergoing drug rehabilitation treatment (yes vs. no), ever registered as a drug user (yes vs. no), and ever convicted for drug-related crimes (yes vs. no). All variables were measured for the past 6 months, unless otherwise stated.

The contents of the study questionnaire were adapted from several different studies previously conducted in Myanmar. The socio-demographic characteristics, drug use behavior, and health service utilization-related questions were adapted from the Rapid Assessment and Response on Drug Use and from the HIV Survey of the Asian Harm Reduction Network, Myanmar.[15] Sexual behavior and HIV testing behavior-related questions were adapted from the Behavioral Surveillance Survey (BSS) Questionnaire of the Ministry of Health, Myanmar.[13] Pre-testing of the full questionnaire used in this study was carried out prior to data collection in Lashio with 20 IDUs and 20 NIDUs.

Data collection

After obtaining written informed consent from each participant, the lead researcher and six trained interviewers conducted interviews toward data collection. Participants were interviewed individually for 30-40 minutes in a private setting. Most interviews were

conducted at a DIC. The research team also went to various field sites (shooting gallery, drug users' homes, cemetery, etc.) to recruit participants who were willing to participate in the study but did not want to come to the DIC.

Data analysis

Data were coded and entered using the Statistical Package for the Social Sciences (SPSS) version 16 (SPSS Inc., Chicago, IL, USA) for all analyses. Data analysis was carried out separately for IDUs and NIDUs. Descriptive statistics and χ^2 tests were used to compare participants' background characteristics. Bivariate analyses were initially conducted to examine factors associated with HIV testing. Finally, all covariates were simultaneously entered into the multiple regression model to calculate adjusted odds ratios (AORs), 95% confidence intervals (CIs), and corresponding *P*-values.

Ethical considerations

This study protocol was approved by the Research Ethics Committee of the Graduate School of Medicine, the University of Tokyo, Japan and by the Institutional Ethical Review Committee of the Department of Medical Research (Lower Myanmar), Ministry of Health, Yangon, Myanmar. The objectives of the study were made clear to respondents before their voluntary participation, and individual written informed

consent was obtained from all participants. Each participant was allowed to withdraw from the study at any time. Confidentiality of the entire data set was maintained at all stages of data collection and analysis.

Results

Socio-demographic and drug use characteristics (Table 1)

Of the 368 respondents, 158 were IDUs and 210 were NIDUs. The mean age was significantly different between IDUs and NIDUs; 29.8 (SD 6.7) years for IDUs and 25.5 (SD 5.8) years for NIDUs ($P < 0.001$). With regard to education levels, about a third of IDUs and NIDUs had primary or no formal education. Overall, 12.7% of IDUs and a significantly higher percentage of NIDUs (31.9%) had migrated to Lashio from another part of Myanmar ($P <0.001$).

Factors associated with HIV testing among injecting drug users (Table 2)

In total, 76.6 % of IDUs had ever tested for HIV. Bivariate analysis showed that those belonging to the older age group (odds ratio [OR] 2.57; 95% CI: 1.17-5.66) and those who had a regular job (OR 2.91; 95% CI: 1.26-6.70) were more likely to have tested for HIV. Conversely, IDUs who practiced risky behaviors such as using more than two kinds of drugs (poly drugs) (OR 0.40; 95% CI: 0.18-0.85) and injecting drugs at least

twice daily (OR 0.41; 95% CI: 0.19-0.88) were less likely to have tested for HIV. Participants who had ever received drug treatment (OR 14.57; 95% CI: 5.82-36.47), who had ever registered as a drug user (OR 5.33; 2.25-12.62), and who perceived themselves as being at risk of HIV infection (OR 3.57; 95% CI: 1.51-8.43) were significantly more likely to have tested for HIV.

The multiple regression model for IDUs indicated that those who were married (AOR 0.24; 95% CI: 0.06-0.94) and who injected drugs at least twice daily (AOR 0.30; 95% CI: 0.09-0.97) were less likely to have tested for HIV. Meanwhile, IDUs having a regular job (AOR 4.50; 95% CI: 1.08-23.17), who had received drug treatment (AOR 13.07; 95% CI: 3.38-50.53), and who perceived themselves as being at risk of contracting HIV (AOR 5.70; 95% CI: 1.40-23.25) were more likely to have undergone HIV testing.

Factors associated with HIV testing among non-injecting drug users (Table 3)

Nearly half of NIDUs (45.7%) had ever tested for HIV. Being of Shan (OR 0.28; 95% CI: 0.12-0.62) or Kachin (OR 0.21; 95% CI: 0.09-0.49) ethnicity, reporting poly drug use (OR 0.40; 95% CI: 0.21-0.74), and having visited a female sex worker within the last 3 months (OR 0.50; 95% CI: 0.29-0.88) were negatively associated with HIV

testing. Conversely, NIDUs who had ever received drug treatment (OR 2.73; 95% CI: 1.51-4.92), had ever registered as a drug user (OR 3.48; 95% CI: 1.61-7.49), and who perceived themselves at being at risk of HIV infection (OR 3.29; 95% CI: 1.86-5.83) were more likely to have tested for HIV.

In the multiple regression model for NIDUs, individuals who were of Shan (AOR 0.30; 95% CI: 0.11-0.84) or Kachin (AOR 0.30; 95% CI: 0.10-0.87) ethnicity and who reported poly drug use within the last three months (AOR 0.33; 95% CI: 0.14-0.77) were less likely to have tested for HIV. Similar results as were observed among IDUs were also observed among NIDUs. Namely, NIDUs who had ever received drug treatment (AOR 3.58; 95% CI: 1.38-9.24), who had ever registered as a drug user (AOR 4.38; 95% CI: 1.31-14.65), and who perceived themselves as being at risk of HIV infection (AOR 4.46; 95% CI: 2.06-9.65) were more likely to have tested for HIV.

Discussion

This is the first study to identify factors associated with HIV testing uptake among IDUs and NIDUs in Lashio, where HIV prevalence among IDUs has been one of the highest in Myanmar.[13] The HIV testing rate among IDUs was higher compared to that among NIDUs' where harm reduction programs were implemented, especially where such

programs targeted IDUs. Such harm reduction programs include primary health care services, needle and syringe exchange programs, recreational activities (tea, video, sports, and games), and drug/HIV counseling. [16] Among IDUs, 76.6% had ever tested for HIV, while 45.7% of NIDUs had ever tested for HIV. These percentages are much higher compared to one-year testing rates reported among Italian drug users: 37.4% for IDUs and 28% for NIDUs.[17] Nonetheless, a comparably high HIV testing rate (76.2%) in the past 6 months was reported among Thai IDUs.[18]

HIV testing was positively associated with ever having received drug treatment and with perception of personal risk of HIV infection among both IDUs and NIDUs. IDUs who had a regular job at the time of survey were also more likely to have undergone HIV testing. Married IDUs and IDUs who injected at least twice daily, meanwhile, were less likely to have undergone HIV testing. Among NIDUs, those who had ever registered as a drug user were more likely to have undergone HIV testing. NIDUs of Shan or Kachin ethnicity and who reported poly drug use within the last three months were less likely to have undergone HIV testing.

Notably, both IDUs and NIDUs who had ever received drug treatment were more likely to have been tested for HIV. This finding is in line with studies conducted in similar populations globally. In Vietnam, female sex workers who spent time in a

rehabilitation center were more likely to have tested for HIV.[19] Moreover, IDUs in Italy who had ever received both pharmacological and psychological treatments were more likely to have tested for HIV than were those who underwent only one kind of treatment.[17]

Drug treatment is playing an important role to reduce risk of HIV infection among IDUs and NIDUs alike.[20] However, HIV testing is not currently a compulsory service at drug treatment centers (DTCs) in Myanmar unless a drug user undergoing detoxification requests it. Since HIV testing and counseling effectively reduce risk behaviors in drug using populations, the United States Centers for Disease Control and Prevention recommends that HIV testing should be integrated into drug treatment services.[20] Expanding drug treatment to incorporate HIV testing services may increase the number of IDUs and NIDUs accessing HIV testing services in Myanmar, too.

In the present study, NIDUs who registered as drug users in the Government facilities were more likely to have been tested for HIV. Registration as a drug user is a way to access drug treatment, including MMT and other medical services, at government-run facilities in Myanmar. Following registration, a drug user is scheduled to receive a minimum of six weeks compulsory detoxification. Drug users who fail to register or do not comply with treatment may result inface a three-to-five-year prison

sentence. Currently, drug treatment in Myanmar is provided through 26 major DTCs, with a 450 bed capacity per day, and 40 minor DTCs. [21] Encouraging drug users to register as such may be effective to increase the uptake of HIV testing services among drug users. Nevertheless, most of the drug users surveyed were reluctant to register their drug use due to several barriers, including stigma toward drug addicts, financial problems,[22] fear of being known as a drug user, low perceived efficacy of available treatment, and the possibility of losing employment opportunities.[23 24]

Among both IDUs and NIDUs, those who had engaged in high-risk behaviors were less likely to have tested for HIV. Additionally, IDUs who injected at least twice daily as well as IDUs and NIDUs who used more than two drugs (poly drug use) were less likely to have been tested for HIV. A similar finding was reported in Thailand, where IDUs who practiced high-risk behaviors were also less likely to undergo HIV testing. [18] It is not surprising that drug users are more prone to feel reticent to learn of their HIV status through testing due to their risky behaviors [25], and to stigma/discrimination related to drug use and its illegality.[19 26] However, injecting drug use is the main mode of HIV transmission in Myanmar, [2 3] and studies indicate that poly drug users are especially likely to practice unsafe sexual behaviors. [27 28] HIV transmission among drug users engaging in risky behaviors might thus be fueling the

HIV epidemic in Myanmar. Hence, HIV testing programs targeting drug users who exhibit high-risk behaviors are urgently needed, and such programs might also fruitfully incorporate educational campaigns toward reducing discrimination against drug use.

In this study, perceived risk of HIV infection was a significant predictor for HIV testing among both types of drug users (i.e. IDUs and NIDUs). Such individuals may perceive themselves as at risk of HIV infection after learning their partner's HIV status,[29] or they may be compelled to consider the implications of their risky drug use and sexual behaviors [30], prompting them to seek HIV counseling and to have their HIV status tested. In this study, we did not confirm participants' HIV status due to ethical considerations. Regardless of HIV status and risk behaviors, however, perceived risk of HIV infection would appear to serve as a self-protective behavior which can motivate individuals to practice safer behaviors.

This study showed that IDUs who had a regular job were more likely to have been tested for HIV infection. One possible explanation for this is that the Myanmar National AIDS Programs have included the workplace as a priority setting for intervention/prevention efforts.[31] Thus, IDUs with a regular job are likely to have been tested for HIV infection through such programs. On the other hand, conflicting findings have emerged from studies of Russian IDUs [32] and tuberculosis patients from Uganda [33]

and Ethiopia. [34] In these studies, unemployed or part-time workers were more likely to test for HIV than were employed or full-time workers. Further investigation may thus be necessary to explore the impact of employment status on HIV testing behaviors in different contexts.

In the present study, married IDUs were less likely to have been tested for HIV than were single IDUs. This is an important finding, as two-fifths of all new HIV infections in Myanmar occurred through husband-to-wife transmission in 2010. Moreover, the trend of husband-to-wife transmission is estimated to increase to nearly half of all new infections among women by 2015. [35] In China, too, married men who have sex with men (MSM) were less likely to have been tested for HIV than were single men.[36] Clearly, HIV testing programs urgently need to focus on encouraging married IDUs to undergo HIV testing.

Another important finding was that NIDUs who were of Shan or Kachin ethnicities were less likely to have tested their HIV status than were those of Burma ethnicity. This may be because most of the IEC materials, HIV testing information, and HIV counseling services were conducted in the Myanmar language, with which Shan and Kachin ethnicities are not always familiar. Owing to a lack of Myanmar language ability, participants who do not speak or read the Myanmar language may have had

difficulty in accessing HIV testing services. Other ethnicities would also benefit if HIV testing services could be conducted in languages representing a broader range of ethnicities such as Shan and Kachin, or if the services could employ staff conversant in the languages of other ethnicities.

Our findings are derived from a cross-sectional study; as such, several possible limitations should be noted in their interpretation. First, HIV testing was self-reported by drug users, and we were not able to confirm their HIV status. Second, our results may not be generalized to drug users in other cities or to drug users who did not participate in this study because they may have different characteristics than those who participated in the study. However, our findings are generally consistent with those of another study from Thailand.[18]

Despite their potential limitations, our results present the first look at HIV testing behaviors among drug users in Lashio, Myanmar's famous border trade city, with a high burden of HIV infection. At the same time, further research is needed to understand barriers and decisions to access HIV testing among drug users, especially for those who are married and engaged in risky behaviors.

Conclusions

Both IDUs and NIDUs who had ever received drug treatment were more likely to have tested for HIV in the present study. More IDUs received HIV testing compared to NIDUs. Low HIV testing rates were found among IDUs who were married and who injected at least twice daily and among NIDUs reporting poly drug use within the last three months and who were of Kachin or Shan ethnicity. To increase HIV testing rates, especially among NIDUs, we need to encourage them to register as drug users and to provide them with HIV services in the Myanmar language as well as in other ethnic languages. Integrating HIV testing into existing drug treatment programs and expanding drug treatment services thus emerges as an effective way to increase utilization of HIV testing among both types of drug users in Myanmar.

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Competing interests:

None.

Ethical approval

The study was approved by the Research Ethics Committee of the Graduate School of Medicine, the University of Tokyo, Japan, and the Institutional Ethical Review Committee, Department of Medical Research (Lower Myanmar), Ministry of Health, Yangon, Myanmar.

Provenance and peer review

Not commissioned; externally peer reviewed.

Data sharing statement

Extra data are available from the corresponding author.

Contributing authors:

Yu Mon Saw and Junko Yasuoka participated in the design of the study, conducted the statistical analyses, and drafted the article. Krishna C. Poudel participated in the analysis and interpreted the results. Yu Mon Saw, Thu Nandar Saw, and Soe Tun oversaw the implementation of the study. Masamine Jimba supervised the study and the revisions to the article. All authors contributed to the writing of the manuscript and approved the final draft.

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Table.1 Socio-demographic characteristics of participants (N=368)

Characteristics	Injecting drug user (n=158)		Non-injecting drug user (n=210)		P-vaule
	n/mean	%/SD	n/mean	%/SD	
Age	***29.8***	***7.2***	***25.5***	***5.8***	<0.001
≤ 20	17	(10.8)	40	(19.0)	
21-30	77	(48.7)	134	(63.8)	
31-40	50	(31.6)	30	(14.3)	
41-50	14	(8.9)	6	(2.9)	
Ethnicity					0.943
Burma	35	(22.2)	45	(21.4)	
Shan	46	(29.1)	66	(31.4)	
Kachin	35	(22.2)	48	(22.9)	
Others	42	(26.5)	51	(24.3)	
Marital status					0.137
Single	75	(47.5)	110	(52.4)	
Married	66	(41.8)	68	(32.4)	
Divorced/Widower	17	(10.7)	32	(15.2)	
Education					0.227
Primary/No formal education	52	(32.9)	61	(29.0)	
Secondary education	58	(36.7)	67	(31.9)	
High school and higher education	48	(30.4)	82	(39.0)	
Employment status					0.315
Non-regular job	32	(20.3)	34	(16.2)	
Regular job	126	(79.7)	176	(83.8)	
Living status (Inter-regional migration)					<0.001
Resident	138	(87.3)	143	(68.1)	
Migrant	20	(12.7)	67	(31.9)	

Mean age 29.8 (SD 7.2) for IDUs and 25.5 (SD 25.5) for NIDUs

Table 2. Factors associated with HIV testing among injecting drug user in Lashio,Myanmar (N=158)

	N	%	OR	95%CI	AOR	95%CI
Age						
≤ 29	68	43.0				
> 29	90	57.0	2.57	1.17-5.66*	2.06	0.63-6.76
Marital status						
Single	75	47.4				
Married	66	41.8	0.61	0.28-1.35	0.24	0.06-0.94*
Divorced/Widower	17	10.8	0.55	0.17-1.82	0.26	0.04-1.94
Education						
Primary/No formal education	61	29.0				
Secondary education	67	31.9	1.57	0.64-3.86	2.59	0.63-10.60
High school or above	82	39.1	1.11	0.45-2.71	1.82	0.29-4.86
Ethnicity						
Burma	35	22.2				
Shan	46	29.0	0.93	0.27-3.22	2.15	0.32-14.57
Kachin	35	22.2	0.22	0.07-0.71*	0.58	0.11-2.94
Others	42	26.6	0.53	0.16-1.74	0.83	0.16-4.27
Employment status						
Non-regular job	32	20.3				
Regular job	126	79.7	2.91	1.26-6.70*	4.50	1.08-23.17*
Living status (Inter-regional migration)						
Migrant	20	12.7				
Resident	138	87.3	0.80	0.25-2.55	0.81	0.14-4.81
Most used drug type in the past 3 months						
Heroin	156	98.7	S/S		S/S	
Stimulant and others	2	1.3				
Had history of poly drug use in the past 3 months						
Never	83	52.5				
Ever	75	47.5	0.40	0.18-0.85*	0.44	0.14-1.43
Had history of unsafe injection practice in the past 3 months						
No	107	52.5				
Yes	51	47.5	1.72	0.76-3.86	1.01	0.27-3.84
Frequency of injection per day						
≤ 2	86	54.4				
> 2	72	45.6	0.41	0.19-0.88*	0.30	0.09-0.97*
Had history of FSW visit in the past 3 months						
Never	73	46.2				
Ever	85	53.8	0.74	0.35-1.56	1.34	0.25-7.12
Sexual orientation						
Hetero-sexual	135	85.4				
Bi/Homo-sexual	23	14.6	0.21	0.08-0.53**	0.61	0.13-2.84
Had more than one partners in the past 3 months						
No	73	46.2				
Yes	85	53.8	0.40	0.18-0.89*	0.20	0.04-1.11
Ever received drug treatment						
No	31	19.6				
Yes	127	80.4	14.57	5.82-36.47**	13.07	3.38-50.53***
Ever register as a drug user						
No	78	49.4				
Yes	80	50.6	5.33	2.25-12.62**	2.21	0.57-8.63
Ever been in prison or jail						
No	106	67.1				
Yes	52	32.9	0.56	0.26-1.19	0.44	0.10-1.84
Perceived HIV risk						
No	90	57.0				
Yes	68	43.9	3.57	1.51-8.43**	5.70	1.40-23.25*

Note. OR: odd Ratio;CI: confidence interval; AOR: adjusted odd ratio; FSW: female sex worker

§ Had either receptive or distributive needle/syringe sharing

* p <0.05;** p <0.01; *** p <0.001; S/S=small sample size

Table 3. Factors associated with HIV testing among non- injecting drug user in Lashio,Myanmar (N= 210)

	N	%	OR	95%CI	AOR	95%CI
Age						
≤ 25	116	55.2				
> 25	94	44.8	1.17	0.68-2.02	0.75	0.33-1.71
Marital status						
Single	110	52.4				
Married	68	32.4	0.62	0.33-1.15	0.52	0.22-1.21
Divorced/Widower	32	15.2	0.88	0.40-1.94	0.39	0.13-1.18
Education						
Primary/No formal education	52	32.9				
Secondary education	58	36.7	2.04	1.01-4.13	2.38	0.95-5.97
High school or above	48	30.4	1.29	0.66-2.55	1.48	0.58-3.77
Ethnicity						
Burma	45	21.4				
Shan	66	31.4	0.28	0.12-0.62*	0.30	0.11-0.84*
Kachin	48	22.9	0.21	0.09-0.49**	0.30	0.10-0.87*
Others	51	24.3	0.43	0.19-1.00	0.52	0.18-1.49
Employment status						
Non-regular job	34	16.2				
Regular job	176	83.8	1.67	0.78-3.59	1.35	0.44-4.14
Living status (Inter-regional migration)						
Migrant	67	31.9				
Resident	143	68.1	0.52	0.29-0.94*	0.55	0.26-1.17
Most used drug type in the past 3 months						
Heroin	87	41.4				
Stimulant and others	123	58.6	1.15	0.66-2.00	1.54	0.63-3.79
Had history of poly drug use in the past 3 months						
Never	58	27.6				
Ever	152	72.4	0.40	0.21-0.74*	0.33	0.14-0.77**
Had history of FSW visit in the past 3 months						
Never	80	38.1				
Ever	130	61.9	0.50	0.29-0.88*	0.63	0.30-1.33
Sexual orientation						
Hetero-sexual	76	36.2				
Bi/Homo-sexual	134	63.8	1.77	0.99-3.14	1.72	0.73-4.03
Had more than one partners in the past 3 months						
No	35	16.7				
Yes	175	83.3	0.87	0.42-1.80	0.80	0.27-2.38
Ever received drug treatment	139	66.2				
No	71	33.8	2.73	1.51-4.92**	3.58	1.38-9.24**
Yes						
Ever register as a drug user						
No	173	82.4				
Yes	37	17.6	3.48	1.61-7.49**	4.38	1.31-14.65**
Ever been in prison or jail						
No	174	82.9				
Yes	36	17.1	1.08	0.52-2.21	1.28	0.35-4.65
Perceived HIV risk						
No	120	57.1				
Yes	90	42.9	3.29	1.86-5.83*	4.46	2.06-9.65***

Note. OR: odd Ratio;CI: confidence interval; AOR: adjusted odd ratio; FSW: female sex worker

* p <0.05;** p <0.01; *** p <0.001; S/S=small sample size

Factors associated with HIV testing among male injecting and non-injecting drug users in Lashio, Myanmar: A cross-sectional study

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Abstract

Objectives: HIV testing is an effective intervention for reducing HIV risk and providing information on HIV status. However, uptake of HIV testing is a major challenge within the drug-using population due to the stigma and discrimination associated with their illegal drug use behaviors. This study thus aimed to identify factors associated with HIV testing among injecting (IDUs) and non-injecting drug users (NIDUs) in Lashio, Myanmar.

Methods: A cross-sectional study was conducted from January to February 2010. In total, 158 male IDUs and 210 male NIDUs were recruited using a respondent-driven sampling method. Multivariate analysis was performed separately for IDUs and NIDUs.

Results: Approximately 77% of IDUs and 46% of NIDUs were ever tested for HIV. The multivariate analysis revealed that having ever received drug treatment was positively associated with HIV testing among both IDUs (adjusted odds ratio [AOR] 13.07; 95% confidence interval [CI]: 3.38-50.53) and NIDUs (AOR 3.58; 95% CI: 1.38-9.24). IDUs who were married (AOR 0.24; 95% CI: 0.06-0.94) and who injected at least twice daily (AOR 0.30; 95%CI: 0.09-0.97) were less likely to undergo HIV testing. Among NIDUs, those who belonged to Shan (AOR 0.30; 95%CI: 0.11-0.84) or Kachin (AOR 0.30; 95%CI: 0.10-0.87) ethnicities were less likely to test for HIV.

Conclusions: IDUs and NIDUs who have received drug treatment are more likely to test for HIV. Integrating HIV testing into drug treatment programs alongside general expansion of HIV testing services may be effective to increase HIV testing uptake among both IDUs and NIDUs in the Northern Shan State of Myanmar.

Key words: HIV, drug users, diagnosis, Myanmar

Introduction

Myanmar is one of the countries hardest hit by the HIV epidemic in South-East Asia. According to the Joint United Nations Programme on AIDS (UNAIDS), approximately 240,000 people were living with HIV/AIDS at the end of 2011, and HIV prevalence was 0.5% within Myanmar's adult population.[1] Injecting drug use is a primary mode of HIV transmission in the country. The estimated number of drug users in 2008 was 300,000-400,000, of whom 90,000-150,000 were injecting drug users (IDUs). [2 3] HIV prevalence among IDUs was 21.9 % in 2011.[1] To tackle this problem, Myanmar has actively promoted condom use, improved the management of sexually transmitted infections (STIs), and made access to HIV testing and counseling services more widespread.

HIV testing is a highly cost-effective intervention for reduction of HIV risk and transmission.[4] Early discovery of HIV infection in individuals is essential to provide HIV-related care and treatment, and to prevent further spread of the disease to others. In addition, HIV testing and counseling can increase knowledge of HIV/AIDS, reduce risky sexual and drug use behaviors, and prevent other STIs. [5-9] It is therefore important to encourage IDUs and non-injecting drug users (NIDUs) to be tested for HIV infection.

In Myanmar, both the government and international non-governmental organizations (INGOs) have been providing a variety of HIV testing services including

referrals and pre- and post-test counseling.[10] By the end of 2006, 289 service delivery points were providing HIV testing services in Myanmar – 53% implemented through the government sector, and 47% through INGOs.[11] However, HIV testing uptake has been a major challenge within the drug using populations. Due to varying levels of stigma and discrimination associated with drug use and its illegality, access to mainstream public health services is often limited in the drug using population.[12] In Myanmar, drug treatment, including methadone maintenance treatment (MMT), is provided through government run medical facilities, and HIV testing is not a compulsory service in the treatment.

Despite the critical importance of these population sub-groups to HIV prevention and treatment efforts, only limited information is available on the characteristics of both IDUs and NIDUs undergoing HIV testing in Myanmar. Therefore, the purpose of this study was to identify the characteristics of IDUs and NIDUs undergoing HIV testing, and to identify factors associated with testing uptake in Lashio Township, Northern Shan State, Myanmar.

Methods

Study design and area

A cross-sectional study was conducted in Lashio city in the Northern Shan State of

Myanmar, a small hill-town located close to the Chinese border. Data were collected in January and February 2010. Lashio is one of the townships in Myanmar recommended as a priority focus for HIV interventions due to the high HIV prevalence among IDUs – 48.5 % in 2007.[13] Information on HIV prevalence among NIDUs, meanwhile, is not available in Myanmar.

Study Participants

In this study, IDUs were defined as individuals having visible signs of injection, as confirmed by medical personnel in a private setting, and/or who had injected drugs in the past 6 months. NIDUs were defined as those with no history of injecting drug use and those who had used drugs by a non-injecting route in the past 6 months. Study participants were recruited using the following criteria: 1) male IDU or NIDU, 2) aged 18 years or older, 3) had used drugs in the last 6 months, 4) exhibiting no withdrawal symptoms and not under the influence of drugs at the time of interview, and 5) able to speak the Myanmar language.

A total of 176 IDUs and 217 NIDUs were ultimately enrolled in the study. Of them, 18 IDUs and 7 NIDUs were excluded from analysis because of incomplete responses. The remaining participants, 158 IDUs and 210 NIDUs, were included in the data analysis.

Sampling method

A respondent-driven sampling (RDS) method was used to recruit participants as an approach generally regarded as effective for reaching hidden populations.[14] The method uses dual incentives and a structured coupon disbursement process of "peer referral" to reduce typical flaws and biases inherent in sampling of hidden populations'. The first-round respondents, also known as "seeds", were recruited from the pool of service-recipients at a local drop-in center (DIC). From three seeds (two IDUs and one NIDU) were recruited a total of 174 IDUs and 216 NIDUs (not including seeds) meeting the study criteria. The recruitment process did not distinguish between IDUs and NIDUs. Both IDUs and NIDUs were allowed to recruit any friends who used drugs by either means of administration. Distribution of coupons was terminated when the target sample size was attained. The successfully recruited participant was then provided with three coupons with serial numbers and instructions for passing those coupons to peers who were currently using drugs. Coupons were given a 2-week expiration date. The second respondent was also recruited in the same way.

All respondents recruited in this manner received an Information, Education and Communication (IEC) pack that included two condoms with gel packs along with an

incentive of 2000 Kyats (US$ 2.5) as compensation for their time and travel. Respondents were eligible to receive a secondary incentive if recruits referred through them showed up at study sites to participate within the expiration period designated on their recruitment coupons. The secondary incentive was 500 kyats (0.5$) per recruitment.

Measures

The dependent variable was ever experience of HIV testing. Specific HIV testing behavior-related variables included ever having undergone an HIV test, HIV testing frequency, date of last HIV testing, and site of last HIV testing. The independent variables were socio-demographic characteristics, drug use, sexual history, HIV testing behaviors, and health service utilization behaviors.[13 15] Assessed socio-demographic variables included age (IDUs: ≤29 years old vs. >29 years old; NIDUs: ≤25 years old vs. >25 years old), marital status (single vs. married vs. divorced/widowed), race/ethnicity (Burma vs. Shan vs. Kachin vs. Other), educational background (primary/ no formal education vs. secondary education vs. high school or above), employment (non-regular job vs. regular job), and Lashio residence status (migrant vs. resident).

Variables on drug use and sexual behaviors included type of illicit drug use, route of administration for drug use, frequency of injecting drug use, unsafe injecting

practice (receptive or distributive syringe sharing; yes vs. no), poly drug use (yes vs. no), disclosure of sexual orientation (hetero- vs. bi/homosexual), having more than one partner (yes vs. no), and history of female sex worker visit (yes vs. no). Variables regarding health services utilization included ever undergoing drug rehabilitation treatment (yes vs. no), ever registered as a drug user (yes vs. no), and ever convicted for drug-related crimes (yes vs. no). All variables were measured for the past 6 months, unless otherwise stated.

The contents of the study questionnaire were adapted from several different studies previously conducted in Myanmar. The socio-demographic characteristics, drug use behavior, and health service utilization-related questions were adapted from the Rapid Assessment and Response on Drug Use and from the HIV Survey of the Asian Harm Reduction Network, Myanmar.[15] Sexual behavior and HIV testing behavior-related questions were adapted from the Behavioral Surveillance Survey (BSS) Questionnaire of the Ministry of Health, Myanmar.[13] Pre-testing of the full questionnaire used in this study was carried out prior to data collection in Lashio with 20 IDUs and 20 NIDUs.

Data collection

After obtaining written informed consent from each participant, the lead researcher and six trained interviewers conducted interviews toward data collection. Participants were interviewed individually for 30-40 minutes in a private setting. Most interviews were

conducted at a DIC. The research team also went to various field sites (shooting gallery, drug users' homes, cemetery, etc.) to recruit participants who were willing to participate in the study but did not want to come to the DIC.

Data analysis

Data were coded and entered using the Statistical Package for the Social Sciences (SPSS) version 16 (SPSS Inc., Chicago, IL, USA) for all analyses. Data analysis was carried out separately for IDUs and NIDUs. Descriptive statistics and χ^2 tests were used to compare participants' background characteristics. Bivariate analyses were initially conducted to examine factors associated with HIV testing. Finally, all covariates were simultaneously entered into the multiple regression model to calculate adjusted odds ratios (AORs), 95% confidence intervals (CIs), and corresponding *P*-values.

Ethical considerations

This study protocol was approved by the Research Ethics Committee of the Graduate School of Medicine, the University of Tokyo, Japan and by the Institutional Ethical Review Committee of the Department of Medical Research (Lower Myanmar), Ministry of Health, Yangon, Myanmar. The objectives of the study were made clear to respondents before their voluntary participation, and individual written informed

consent was obtained from all participants. Each participant was allowed to withdraw from the study at any time. Confidentiality of the entire data set was maintained at all stages of data collection and analysis.

Results

Socio-demographic and drug use characteristics (Table 1)

Of the 368 respondents, 158 were IDUs and 210 were NIDUs. The mean age was significantly different between IDUs and NIDUs; 29.8 (SD 6.7) years for IDUs and 25.5 (SD 5.8) years for NIDUs ($P < 0.001$). With regard to education levels, about a third of IDUs and NIDUs had primary or no formal education. Overall, 12.7% of IDUs and a significantly higher percentage of NIDUs (31.9%) had migrated to Lashio from another part of Myanmar ($P <0.001$).

Factors associated with HIV testing among injecting drug users (Table 2)

In total, 76.6 % of IDUs had ever tested for HIV. Bivariate analysis showed that those belonging to the older age group (odds ratio [OR] 2.57; 95% CI: 1.17-5.66) and those who had a regular job (OR 2.91; 95% CI: 1.26-6.70) were more likely to have tested for HIV. Conversely, IDUs who practiced risky behaviors such as using more than two kinds of drugs (poly drugs) (OR 0.40; 95% CI: 0.18-0.85) and injecting drugs at least

twice daily (OR 0.41; 95% CI: 0.19-0.88) were less likely to have tested for HIV. Participants who had ever received drug treatment (OR 14.57; 95% CI: 5.82-36.47), who had ever registered as a drug user (OR 5.33; 2.25-12.62), and who perceived themselves as being at risk of HIV infection (OR 3.57; 95% CI: 1.51-8.43) were significantly more likely to have tested for HIV.

The multiple regression model for IDUs indicated that those who were married (AOR 0.24; 95% CI: 0.06-0.94) and who injected drugs at least twice daily (AOR 0.30; 95% CI: 0.09-0.97) were less likely to have tested for HIV. Meanwhile, IDUs having a regular job (AOR 4.50; 95% CI: 1.08-23.17), who had received drug treatment (AOR 13.07; 95% CI: 3.38-50.53), and who perceived themselves as being at risk of contracting HIV (AOR 5.70; 95% CI: 1.40-23.25) were more likely to have undergone HIV testing.

Factors associated with HIV testing among non-injecting drug users (Table 3)

Nearly half of NIDUs (45.7%) had ever tested for HIV. Being of Shan (OR 0.28; 95% CI: 0.12-0.62) or Kachin (OR 0.21; 95% CI: 0.09-0.49) ethnicity, reporting poly drug use (OR 0.40; 95% CI: 0.21-0.74), and having visited a female sex worker within the last 3 months (OR 0.50; 95% CI: 0.29-0.88) were negatively associated with HIV

testing. Conversely, NIDUs who had ever received drug treatment (OR 2.73; 95% CI: 1.51-4.92), had ever registered as a drug user (OR 3.48; 95% CI: 1.61-7.49), and who perceived themselves at being at risk of HIV infection (OR 3.29; 95% CI: 1.86-5.83) were more likely to have tested for HIV.

In the multiple regression model for NIDUs, individuals who were of Shan (AOR 0.30; 95% CI: 0.11-0.84) or Kachin (AOR 0.30; 95% CI: 0.10-0.87) ethnicity and who reported poly drug use within the last three months (AOR 0.33; 95% CI: 0.14-0.77) were less likely to have tested for HIV. Similar results as were observed among IDUs were also observed among NIDUs. Namely, NIDUs who had ever received drug treatment (AOR 3.58; 95% CI: 1.38-9.24), who had ever registered as a drug user (AOR 4.38; 95% CI: 1.31-14.65), and who perceived themselves as being at risk of HIV infection (AOR 4.46; 95% CI: 2.06-9.65) were more likely to have tested for HIV.

Discussion

This is the first study to identify factors associated with HIV testing uptake among IDUs and NIDUs in Lashio, where HIV prevalence among IDUs has been one of the highest in Myanmar.[13] The HIV testing rate among IDUs was higher compared to that among NIDUs' where harm reduction programs were implemented, especially where such

programs targeted IDUs. Such harm reduction programs include primary health care services, needle and syringe exchange programs, recreational activities (tea, video, sports, and games), and drug/HIV counseling. [16] Among IDUs, 76.6% had ever tested for HIV, while 45.7% of NIDUs had ever tested for HIV. These percentages are much higher compared to one-year testing rates reported among Italian drug users: 37.4% for IDUs and 28% for NIDUs.[17] Nonetheless, a comparably high HIV testing rate (76.2%) in the past 6 months was reported among Thai IDUs.[18]

HIV testing was positively associated with ever having received drug treatment and with perception of personal risk of HIV infection among both IDUs and NIDUs. IDUs who had a regular job at the time of survey were also more likely to have undergone HIV testing. Married IDUs and IDUs who injected at least twice daily, meanwhile, were less likely to have undergone HIV testing. Among NIDUs, those who had ever registered as a drug user were more likely to have undergone HIV testing. NIDUs of Shan or Kachin ethnicity and who reported poly drug use within the last three months were less likely to have undergone HIV testing.

Notably, both IDUs and NIDUs who had ever received drug treatment were more likely to have been tested for HIV. This finding is in line with studies conducted in similar populations globally. In Vietnam, female sex workers who spent time in a

rehabilitation center were more likely to have tested for HIV.[19] Moreover, IDUs in Italy who had ever received both pharmacological and psychological treatments were more likely to have tested for HIV than were those who underwent only one kind of treatment.[17]

Drug treatment is playing an important role to reduce risk of HIV infection among IDUs and NIDUs alike.[20] However, HIV testing is not currently a compulsory service at drug treatment centers (DTCs) in Myanmar unless a drug user undergoing detoxification requests it. Since HIV testing and counseling effectively reduce risk behaviors in drug using populations, the United States Centers for Disease Control and Prevention recommends that HIV testing should be integrated into drug treatment services.[20] Expanding drug treatment to incorporate HIV testing services may increase the number of IDUs and NIDUs accessing HIV testing services in Myanmar, too.

In the present study, NIDUs who registered as drug users in the Government facilities were more likely to have been tested for HIV. Registration as a drug user is a way to access drug treatment, including MMT and other medical services, at government-run facilities in Myanmar. Following registration, a drug user is scheduled to receive a minimum of six weeks compulsory detoxification. Drug users who fail to register or do not comply with treatment may result inface a three-to-five-year prison

sentence. Currently, drug treatment in Myanmar is provided through 26 major DTCs, with a 450 bed capacity per day, and 40 minor DTCs. [21] Encouraging drug users to register as such may be effective to increase the uptake of HIV testing services among drug users. Nevertheless, most of the drug users surveyed were reluctant to register their drug use due to several barriers, including stigma toward drug addicts, financial problems,[22] fear of being known as a drug user, low perceived efficacy of available treatment, and the possibility of losing employment opportunities.[23 24]

Among both IDUs and NIDUs, those who had engaged in high-risk behaviors were less likely to have tested for HIV. Additionally, IDUs who injected at least twice daily as well as IDUs and NIDUs who used more than two drugs (poly drug use) were less likely to have been tested for HIV. A similar finding was reported in Thailand, where IDUs who practiced high-risk behaviors were also less likely to undergo HIV testing. [18] It is not surprising that drug users are more prone to feel reticent to learn of their HIV status through testing due to their risky behaviors [25], and to stigma/discrimination related to drug use and its illegality.[19 26] However, injecting drug use is the main mode of HIV transmission in Myanmar, [2 3] and studies indicate that poly drug users are especially likely to practice unsafe sexual behaviors. [27 28] HIV transmission among drug users engaging in risky behaviors might thus be fueling the

HIV epidemic in Myanmar. Hence, HIV testing programs targeting drug users who exhibit high-risk behaviors are urgently needed, and such programs might also fruitfully incorporate educational campaigns toward reducing discrimination against drug use.

In this study, perceived risk of HIV infection was a significant predictor for HIV testing among both types of drug users (i.e. IDUs and NIDUs). Such individuals may perceive themselves as at risk of HIV infection after learning their partner's HIV status,[29] or they may be compelled to consider the implications of their risky drug use and sexual behaviors [30], prompting them to seek HIV counseling and to have their HIV status tested. In this study, we did not confirm participants' HIV status due to ethical considerations. Regardless of HIV status and risk behaviors, however, perceived risk of HIV infection would appear to serve as a self-protective behavior which can motivate individuals to practice safer behaviors.

This study showed that IDUs who had a regular job were more likely to have been tested for HIV infection. One possible explanation for this is that the Myanmar National AIDS Programs have included the workplace as a priority setting for intervention/prevention efforts.[31] Thus, IDUs with a regular job are likely to have been tested for HIV infection through such programs. On the other hand, conflicting findings have emerged from studies of Russian IDUs [32] and tuberculosis patients from Uganda [33]

and Ethiopia. [34] In these studies, unemployed or part-time workers were more likely to test for HIV than were employed or full-time workers. Further investigation may thus be necessary to explore the impact of employment status on HIV testing behaviors in different contexts.

In the present study, married IDUs were less likely to have been tested for HIV than were single IDUs. This is an important finding, as two-fifths of all new HIV infections in Myanmar occurred through husband-to-wife transmission in 2010. Moreover, the trend of husband-to-wife transmission is estimated to increase to nearly half of all new infections among women by 2015. [35] In China, too, married men who have sex with men (MSM) were less likely to have been tested for HIV than were single men.[36] Clearly, HIV testing programs urgently need to focus on encouraging married IDUs to undergo HIV testing.

Another important finding was that NIDUs who were of Shan or Kachin ethnicities were less likely to have tested their HIV status than were those of Burma ethnicity. This may be because most of the IEC materials, HIV testing information, and HIV counseling services were conducted in the Myanmar language, with which Shan and Kachin ethnicities are not always familiar. Owing to a lack of Myanmar language ability, participants who do not speak or read the Myanmar language may have had

difficulty in accessing HIV testing services. Other ethnicities would also benefit if HIV testing services could be conducted in languages representing a broader range of ethnicities such as Shan and Kachin, or if the services could employ staff conversant in the languages of other ethnicities.

Our findings are derived from a cross-sectional study; as such, several possible limitations should be noted in their interpretation. First, HIV testing was self-reported by drug users, and we were not able to confirm their HIV status. Second, our results may not be generalized to drug users in other cities or to drug users who did not participate in this study because they may have different characteristics than those who participated in the study. However, our findings are generally consistent with those of another study from Thailand.[18]

Despite their potential limitations, our results present the first look at HIV testing behaviors among drug users in Lashio, Myanmar's famous border trade city, with a high burden of HIV infection. At the same time, further research is needed to understand barriers and decisions to access HIV testing among drug users, especially for those who are married and engaged in risky behaviors.

Conclusions

Both IDUs and NIDUs who had ever received drug treatment were more likely to have tested for HIV in the present study. More IDUs received HIV testing compared to NIDUs. Low HIV testing rates were found among IDUs who were married and who injected at least twice daily and among NIDUs reporting poly drug use within the last three months and who were of Kachin or Shan ethnicity. To increase HIV testing rates, especially among NIDUs, we need to encourage them to register as drug users and to provide them with HIV services in the Myanmar language as well as in other ethnic languages. Integrating HIV testing into existing drug treatment programs and expanding drug treatment services thus emerges as an effective way to increase utilization of HIV testing among both types of drug users in Myanmar.

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Competing interests:

None.

Ethical approval

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Provenance and peer review

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Data sharing statement

Extra data are available from the corresponding author.

Contributing authors:

Yu Mon Saw and Junko Yasuoka participated in the design of the study, conducted the statistical analyses, and drafted the article. Krishna C. Poudel participated in the analysis and interpreted the results. Yu Mon Saw, Thu Nandar Saw, and Soe Tun oversaw the implementation of the study. Masamine Jimba supervised the study and the revisions to the article. All authors contributed to the writing of the manuscript and approved the final draft.

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Table.1 Socio-demographic characteristics of participants (N=368)

Characteristics	Injecting drug user (n=158)		Non-injecting drug user (n=210)		P-vaule
	n/mean	%/SD	n/mean	%/SD	
Age	***29.8***	***7.2***	***25.5***	***5.8***	<0.001
≤ 20	17	(10.8)	40	(19.0)	
21-30	77	(48.7)	134	(63.8)	
31-40	50	(31.6)	30	(14.3)	
41-50	14	(8.9)	6	(2.9)	
Ethnicity					0.943
Burma	35	(22.2)	45	(21.4)	
Shan	46	(29.1)	66	(31.4)	
Kachin	35	(22.2)	48	(22.9)	
Others	42	(26.5)	51	(24.3)	
Marital status					0.137
Single	75	(47.5)	110	(52.4)	
Married	66	(41.8)	68	(32.4)	
Divorced/Widower	17	(10.7)	32	(15.2)	
Education					0.227
Primary/No formal education	52	(32.9)	61	(29.0)	
Secondary education	58	(36.7)	67	(31.9)	
High school and higher education	48	(30.4)	82	(39.0)	
Employment status					0.315
Non-regular job	32	(20.3)	34	(16.2)	
Regular job	126	(79.7)	176	(83.8)	
Living status (Inter-regional migration)					<0.001
Resident	138	(87.3)	143	(68.1)	
Migrant	20	(12.7)	67	(31.9)	

Mean age 29.8 (SD 7.2) for IDUs and 25.5 (SD 25.5) for NIDUs

Table 2. Factors associated with HIV testing among injecting drug user in Lashio,Myanmar (N=158)

	N	%	OR	95% CI	AOR	95% CI
Age						
≤ 29	68	43.0				
> 29	90	57.0	2.57	1.17-5.66*	2.06	0.63-6.76
Marital status						
Single	75	47.4				
Married	66	41.8	0.61	0.28-1.35	0.24	0.06-0.94*
Divorced/Widower	17	10.8	0.55	0.17-1.82	0.26	0.04-1.94
Education						
Primary/No formal education	61	29.0				
Secondary education	67	31.9	1.57	0.64-3.86	2.59	0.63-10.60
High school or above	82	39.1	1.11	0.45-2.71	1.82	0.29-4.86
Ethnicity						
Burma	35	22.2				
Shan	46	29.0	0.93	0.27-3.22	2.15	0.32-14.57
Kachin	35	22.2	0.22	0.07-0.71*	0.58	0.11-2.94
Others	42	26.6	0.53	0.16-1.74	0.83	0.16-4.27
Employment status						
Non-regular job	32	20.3				
Regular job	126	79.7	2.91	1.26-6.70*	4.50	1.08-23.17*
Living status (Inter-regional migration)						
Migrant	20	12.7				
Resident	138	87.3	0.80	0.25-2.55	0.81	0.14-4.81
Most used drug type in the past 3 months						
Heroin	156	98.7	**S/S**		**S/S**	
Stimulant and others	2	1.3				
Had history of poly drug use in the past 3 months						
Never	83	52.5				
Ever	75	47.5	0.40	0.18-0.85*	0.44	0.14-1.43
Had history of unsafe injection practice in the past 3 months						
No	107	52.5				
Yes	51	47.5	1.72	0.76-3.86	1.01	0.27-3.84
Frequency of injection per day						
≤ 2	86	54.4				
> 2	72	45.6	0.41	0.19-0.88*	0.30	0.09-0.97*
Had history of FSW visit in the past 3 months						
Never	73	46.2				
Ever	85	53.8	0.74	0.35-1.56	1.34	0.25-7.12
Sexual orientation						
Hetero-sexual	135	85.4				
Bi/Homo-sexual	23	14.6	0.21	0.08-0.53**	0.61	0.13-2.84
Had more than one partners in the past 3 months						
No	73	46.2				
Yes	85	53.8	0.40	0.18-0.89*	0.20	0.04-1.11
Ever received drug treatment						
No	31	19.6				
Yes	127	80.4	14.57	5.82-36.47**	13.07	3.38-50.53***
Ever register as a drug user						
No	78	49.4				
Yes	80	50.6	5.33	2.25-12.62**	2.21	0.57-8.63
Ever been in prison or jail						
No	106	67.1				
Yes	52	32.9	0.56	0.26-1.19	0.44	0.10-1.84
Perceived HIV risk						
No	90	57.0				
Yes	68	43.9	3.57	1.51-8.43**	5.70	1.40-23.25*

Note. OR: odd Ratio;CI: confidence interval; AOR: adjusted odd ratio; FSW: female sex worker

§ Had either receptive or distributive needle/syringe sharing

* p <0.05;** p <0.01; *** p <0.001; S/S=small sample size

Table 3. Factors associated with HIV testing among non- injecting drug user in Lashio,Myanmar (N= 210)

	N	%	OR	95%CI	AOR	95%CI
Age						
≤ 25	116	55.2				
> 25	94	44.8	1.17	0.68-2.02	0.75	0.33-1.71
Marital status						
Single	110	52.4				
Married	68	32.4	0.62	0.33-1.15	0.52	0.22-1.21
Divorced/Widower	32	15.2	0.88	0.40-1.94	0.39	0.13-1.18
Education						
Primary/No formal education	52	32.9				
Secondary education	58	36.7	2.04	1.01-4.13	2.38	0.95-5.97
High school or above	48	30.4	1.29	0.66-2.55	1.48	0.58-3.77
Ethnicity						
Burma	45	21.4				
Shan	66	31.4	0.28	0.12-0.62*	0.30	0.11-0.84*
Kachin	48	22.9	0.21	0.09-0.49**	0.30	0.10-0.87*
Others	51	24.3	0.43	0.19-1.00	0.52	0.18-1.49
Employment status						
Non-regular job	34	16.2				
Regular job	176	83.8	1.67	0.78-3.59	1.35	0.44-4.14
Living status (Inter-regional migration)						
Migrant	67	31.9				
Resident	143	68.1	0.52	0.29-0.94*	0.55	0.26-1.17
Most used drug type in the past 3 months						
Heroin	87	41.4				
Stimulant and others	123	58.6	1.15	0.66-2.00	1.54	0.63-3.79
Had history of poly drug use in the past 3 months						
Never	58	27.6				
Ever	152	72.4	0.40	0.21-0.74*	0.33	0.14-0.77**
Had history of FSW visit in the past 3 months						
Never	80	38.1				
Ever	130	61.9	0.50	0.29-0.88*	0.63	0.30-1.33
Sexual orientation						
Hetero-sexual	76	36.2				
Bi/Homo-sexual	134	63.8	1.77	0.99-3.14	1.72	0.73-4.03
Had more than one partners in the past 3 months						
No	35	16.7				
Yes	175	83.3	0.87	0.42-1.80	0.80	0.27-2.38
Ever received drug treatment	139	66.2				
No	71	33.8	2.73	1.51-4.92**	3.58	1.38-9.24**
Yes						
Ever register as a drug user						
No	173	82.4				
Yes	37	17.6	3.48	1.61-7.49**	4.38	1.31-14.65**
Ever been in prison or jail						
No	174	82.9				
Yes	36	17.1	1.08	0.52-2.21	1.28	0.35-4.65
Perceived HIV risk						
No	120	57.1				
Yes	90	42.9	3.29	1.86-5.83*	4.46	2.06-9.65***

Note. OR: odd Ratio;CI: confidence interval; AOR: adjusted odd ratio; FSW: female sex worker

* p <0.05;** p <0.01; *** p <0.001; S/S=small sample size

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	**(*a*) Indicate the study's design with a commonly used term in the title or the abstract** A cross-sectional study that indentified factors associated with HIV testing among injecting (IDU) and non-injecting drug users (NIDUs).	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found HIV testing is an effective intervention for reducing HIV risk. However, uptake of HIV testing is a major challenge within the drug-using population due to their illegal drug use behaviours. This study aimed to identify factors associated with HIV testing among IDUs and NIDUs in Lashio, Myanmar. A cross-sectional study was conducted from January to February 2010. In total, 158 male IDUs and 210 male NIDUs were recruited using a respondent-driven sampling method. A multivariate analysis was performed separately for IDUs and NIDUs. In this study, more IDUs underwent HIV testing than did NIDUs. The multivariate analysis revealed that having ever received drug treatment was positively associated with HIV testing among both IDUs and NIDUs. Integrating HIV testing into drug treatment and expanding drug treatment may be effective to increase HIV testing uptake among both IDUs and NIDUs in Myanmar.	1
Introduction			
Background/rationale	2	**Explain the scientific background and rationale for the investigation being reported** Myanmar is one of the countries hardest hit by the HIV epidemic in South-East Asia. Injecting drug use is a primary mode of HIV transmission in the country. The estimated number of drug users in 2008 was 300,000-400,000, of whom 90,000-150,000 were injecting drug users (IDUs). HIV prevalence among IDUs was 21.9 % in 2011 (NAP/Myanmar, 2012). HIV testing is a highly cost-effective intervention for HIV risk reduction and transmission to the general population. Early detection of HIV infection in individuals is essential to provide HIV-related support, care, and treatment, and to prevent further spread of infection. In addition, HIV testing and counseling can increase knowledge of HIV/AIDS, reduce risky sexual and drug use behaviors, and prevent other STIs. It is therefore important to encourage IDUs and non-injecting drug users (NIDUs) to be tested for HIV infection due to their risk behaviors. However, HIV testing uptake has been a major challenge within the drug using populations. Due to varying levels of stigma and discrimination associated with drug use and its illegality, access to mainstream public health services is often limited in the drug using population. In Myanmar, however, only limited information is available on the characteristics of drug users undergoing HIV testing.	3 to 4
Objectives	3	**State specific objectives, including any prespecified hypotheses** The purpose of this study was to identify the characteristics of IDUs and NIDUs who underwent HIV testing and to identify factors associated with testing uptake in Lashio Township, Northern Shan State, Myanmar. We hypothesized NIDUs tested	4

		HIV than IDUs.	
Methods			
Study design	4	**Present key elements of study design early in the paper** A cross-sectional study	4
Setting	5	**Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection** The study was conducted in Lashio city, Northern Shan State of Myanmar, a small hill-town located close to the Chinese border. Lashio is one of the priority townships in Myanmar that has been recommended for HIV interventions due to the high HIV prevalence among IDUs. IDUs' HIV prevalence in Lashio was 48.5 % in 2007, while that among NIDUs was not available in Myanmar. Data were collected in January and February 2010 using respondent-driven sampling (RDS) method . After obtaining written informed consent from each participant, the lead researcher and six trained interviewers conducted interviews for data collection. They interviewed the participants for 30-40 minutes for each in a private setting. Most interviews were conducted at a local drop-in center (DIC). The lead researcher and trained interviewers went to the field to recruit participants who were willing to participate in this study without coming to a DIC.	5 to 7
Participants	6	**(*a*) Give the eligibility criteria, and the sources and methods of selection of participants** In this study, IDUs were defined as individuals who have visible signs of injection and/or who injected drugs in the past 6 months. NIDUs were defined as those with no history of injecting drug use and those who used drugs by a non-injecting route in the past 6 months. Study participants were recruited using the following criteria: 1) male IDUs and NIDUs, 2) aged 18 years or older, 3) had used drugs in the last 6 months, 4) not suffering from a serious drug dependency and 5) able to speak Myanmar language. A respondent-driven sampling (RDS) method was used to recruit a participant that is an effective method to reach hidden population. The first respondent was recruited from the pool of service-recipients at a local drop-in center. That successfully recruited participant was then provided with three coupons with serial numbers and instructions for passing those coupons to peers who were using drugs currently. Coupons were given a 2-weeks expiration date. The second respondent was also recruited in the same way. All respondents recruited in this manner received an Information, Education and Communication (IEC) pack that included 2 condoms with gel packs along with an incentive of 2000 Kyats (US$ 2.5) as compensation for their time and travel. Respondents were eligible to receive a secondary incentive if recruits referred through them showed up at study sites to participate within the expiry period of their recruitment coupons. The secondary incentive was 500 kyats (0.5$) per recruitment.	5 to 6
Variables	7	**Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable** The outcome variable was ever tested HIV. The exposure variables included socio-demographic characteristic, drug use, sexual, HIV testing behaviors, and health service utilization behaviors of the participants. The contents of the study	6 to 7

		questions were adapted from several different studies in Myanmar.	
Data sources/ measurement	8*	**For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group** The socio-demographic characteristics, drug use behavior and health services utilization questions were adapted from the Rapid Assessment and Response on Drug Use and from the HIV Survey of the Asian Harm Reduction Network, Myanmar . Sexual behaviors and HIV testing behavior questions were adapted from the Behavioral Surveillance Survey (BSS) Questionnaire of the Ministry of Health, Myanmar. Pre-testing of the full questionnaire used in this study was done in Lashio with 20 IDUs and 20 NIDUs before data collection.	7
Bias	9	**Describe any efforts to address potential sources of bias** HIV testing was self-reported by drug users, and we were not able to confirm their HIV status.	16
Study size	10	**Explain how the study size was arrived at** Using RSD method, a total of 176 IDUs and 217 NIDUs were enrolled in this study. Of them, 18 IDUs and 7 NIDUs were excluded from analysis because of incomplete responses. The remaining participants, 158 IDUs and 210 NIDUs, were included in the present data analysis.	5
Quantitative variables	11	**Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why** Data were coded and entered using the Statistical Package for the Social Sciences (SPSS) version 16 (SPSS Inc., Chicago, IL, USA) for all analyses. Data analysis was carried out separately for IDUs and NIDUs.	8
Statistical methods	12	**(*a*) Describe all statistical methods, including those used to control for confounding** Descriptive statistics and χ^2 tests were used to compare background characteristics of the participants. Bivariate analyses were initially conducted to examine factors associated with HIV testing. Finally, multivariate logistic regression was performed to calculate adjusted odds ratios (AORs), 95% confidence intervals (CIs), and corresponding *P*-values.	8
		(*b*) Describe any methods used to examine subgroups and interaction Not applicable	
		(*c*) Explain how missing data were addressed 18 IDUs and 7 NIDUs were excluded from analysis because of incomplete responses. The remaining participants, 158 IDUs and 210 NIDUs, were included in the present data analysis.	5
		(*d*) If applicable, describe analytical methods taking account of sampling strategy Not applicable	
		(*e*) Describe any sensitivity analyses	

		Not applicable	
Results			
Participants	13*	**(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed** 176 IDUs and 217 NIDUs were recruited in this study. Due to incomplete responses, 18 IDUs and 7 NIDUs were excluded from analysis.	5
		(b) Give reasons for non-participation at each stage Not applicable	
		(c) Consider use of a flow diagram Not applicable	
Descriptive data	14*	**(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders** The socio-demographic characteristics of the IDUs and NIDUs. Of the 368 respondents, 158 participants were IDUs and 210 participants were NIDUs. The mean age was significantly different between IDUs and NIDUs; 29.8 (SD 6.7) years for IDUs and 25.5 (SD 5.8) years for NIDUs (P < 0.001). Among IDUs, 48.7% were between 21-30 years and 31.6% were between 31-40 years of age. Of the NIDUs, 63.8% were between 21-30 years and 14.3% were between 31-40 years. With regard to education levels, about a third of IDUs and NIDUs had primary or no formal education. Overall, 12.7% of IDUs and a significantly higher percentage of NIDUs (31.9%) had migrated to Lashio from another part of Myanmar (P <0.001).	9
		(b) Indicate number of participants with missing data for each variable of interest Not applicable	
Outcome data	15*	**Report numbers of outcome events or summary measures** In total, 76.6% of IDUs and 45.7% of NIDUs were ever tested for HIV.	9 to 10
Main results	16	**(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included** **IDUs model** Bivariate analysis showed that those belonging to the older age group (odd ratio [OR] 2.57; 95% confidence interval [CI]: 1.17-5.66) and those who had a regular job (OR 2.91; 95% CI: 1.26-6.70) were more likely to have tested for HIV. Conversely, IDUs who practiced risky behaviors such as using more than two kinds of drugs (poly drugs) (OR 0.40; 95% CI: 0.18-0.85) and injecting drugs more than twice per day (OR 0.41; 95% CI: 0.19-0.88) were less likely to have tested for HIV. Participants who had ever received drug treatment (OR 14.57; 95% CI: 5.82-36.47), who had ever registered as a drug user (OR 5.33; 2.25-12.62), and who perceived themselves as being at risk of HIV infection (OR 3.57; 95% CI: 1.51-8.43) were	9 to 11

		significantly more likely to have tested for HIV. The multivariate model for IDUs indicated that those who were married (AOR 0.24; 95% CI: 0.06-0.94) and injected drugs twice daily (AOR 0.30; 95% CI: 0.09-0.97) were less likely to have tested for HIV. Meanwhile, IDUs having a regular job (AOR 4.50; 95% CI: 1.08-23.17), who had received drug treatment (AOR 13.07; 95% CI: 3.38-50.53), and perceived themselves as being at risk of HIV (AOR 5.70; 95% CI: 1.40-23.25) were more likely to have undergone HIV testing. **NIDUs model** Nearly half of NIDUs (45.7%) had ever tested for HIV. Being of Shan (OR 0.28; 95% CI: 0.12-0.62) or Kachin (OR 0.21; 95% CI: 0.09-0.49) ethnicity, reporting poly drug use (OR 0.40; 95% CI: 0.21-0.74), and having visited a female sex worker within the last 3 months (OR 0.50; 95% CI: 0.29-0.88) were negatively associated with HIV testing. Conversely, NIDUs who had ever received drug treatment (OR 2.73; 95% CI: 1.51-4.92), had ever registered as a drug user (OR 3.48; 95% CI: 1.61-7.49), and who perceived themselves at being at risk of HIV infection (OR 3.29; 95% CI: 1.86-5.83) were more likely to have tested for HIV. In the multivariate model for NIDUs, individuals who were of Shan (AOR 0.30; 95% CI: 0.11-0.84) or Kachin (AOR 0.30; 95% CI: 0.10-0.87) ethnicity and who reported poly drug use within the last three months (AOR 0.33; 95% CI: 0.14-0.77) were less likely to have tested for HIV. Similar results as were observed among IDUs were observed among NIDUs, too. NIDUs who had ever received drug treatment (AOR 3.58; 95% CI: 1.38-9.24), ever registered as a drug user (AOR 4.38; 95% CI: 1.31-14.65), and who perceived themselves as at risk of HIV (AOR 4.46; 95% CI: 2.06-9.65) were more likely to have tested for HIV. We included all variables in the multivariate model to see which factors were most influencing factors of uptake of HIV test analysis even though it was not significant in the bivariate analysis.	
		(*b*) Report category boundaries when continuous variables were categorized Mean age was used to categorize age variable.	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period Not applicable	
Other analyses	17	**Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses** Not applicable	
Discussion		This is the first study to identify the factors associated with HIV testing uptake among IDUs and NIDUs in Lashio, where HIV prevalence among IDUs was one of the highest in Myanmar (NAP/Myanmar, 2008). IDUs' HIV testing rate was higher compared to that of NIDUs' where harm reduction programs were implemented, especially where such programs targeted IDUs. Among IDUs, 76.6% had ever tested for HIV, while 45.7% of NIDUs had ever tested for HIV. These percentages are much higher compared to one-year testing rates reported among Italian drug users: 37.4% for IDUs and 28% for NIDUs (Camoni et al., 2011). HIV testing was positively associated with ever received drug treatment and perception of personal risk of HIV infection among both IDUs and NIDUs. IDUs who had a regular job at the time of survey were also more likely to have undergone HIV testing. Married IDUs and IDUs who injected more than twice daily, meanwhile, were less likely to have undergone HIV testing. Among NIDUs, those who had ever registered as a drug user were more likely to have undergone HIV testing. NIDUs of Shan or Kachin ethnicity and who reported poly drug use within the last three months	11 to 16

were less likely to have undergone HIV testing.

Notably, both IDUs and NIDUs who had ever received drug treatment were more likely to have been tested for HIV. In Vietnam, female sex workers who spent time in a rehabilitation center were more likely to have tested for HIV (Grayman et al., 2005). Also in Italy, IDUs who had ever received both pharmacological and psychological treatments were more likely to have tested for HIV than were those who underwent only one kind of treatment (Camoni et al., 2011). Drug treatment is playing an important role to reduce risk of HIV infection among both drug users (CDC, 2002). However, HIV testing is not currently a compulsory service at drug treatment centers in Myanmar unless a drug user undergoing detoxification requests it. Since HIV testing and counseling effectively reduce risk behaviors in drug using populations, the United States Centers for Disease Control and Prevention recommends that HIV testing should be integrated into drug treatment services (CDC, 2002). Expanding drug treatment to incorporate HIV testing services may increase the number of IDUs and NIDUs accessing HIV testing services in Myanmar, too.

Within both types of drug users, those who had engaged in risk behaviors were less likely to have tested for HIV. Both IDUs who injected twice daily and NIDUs who used more than two drugs (poly drug use) were less likely to have been tested for HIV. It is not surprising that the drug users are more prone to feeling afraid of receiving HIV testing results due to their risky behaviors (Spielberg, Kurth, Gorbach, & Goldbaum, 2001).

In this study, perceived risk of HIV infection was a significant predictor for HIV testing among both drug users. They may perceive themselves as at risk of HIV infection because they learn their partner's HIV status (Adih & Alexander, 1999) or may weigh the implications of their risky drugs use and sexual behaviors (Filipe et al., 2005). In this study, we did not confirm participants' HIV status due to ethical considerations. Regardless of HIV status and risk behaviors, perceived risk of HIV infection is a self-protective behavior which can motivate individuals to practice safer behaviors (Reisen & Poppen, 1999).

This study showed that IDUs who had a regular job were more likely to have been tested for HIV infection. The possible reason for this is that Myanmar National AIDS Programs included workplace as a priority setting for HIV/AIDS intervention/prevention program (NAP/Myanmar, 2010). Thus, IDUs who had a regular job have been tested for HIV infection through those programs. On the other hand, conflicting findings found among Russian IDUs (Niccolai et al., 2010) and tuberculosis patients from Uganda (Sendagire et al., 2010) and Ethiopia (Jerene, Endale, & Lindtjorn, 2007). In these studies, unemployed or part-time workers were more likely to test for HIV than employed or full time workers. In the present study, married IDUs were less likely to have been tested for HIV than single IDUs. This is an important finding since two-fifths of all new HIV infections in Myanmar occurred through husband-to-wife transmission in 2010 and the trend of husband-to-wife transmission is estimated to increase to nearly half of all new infections among women by 2015 (Myat, 2010). HIV testing programs urgently need to focus on encouraging married IDUs to undergo HIV testing. In China, too, married men who have sex with men (MSM) were less likely to have been tested for HIV (Wei et al., 2011).

NIDUs who registered as drug users in the Government facilities were more likely to have been tested for HIV. Encouraging drug users to register as drug users may be effective to increase the uptake of HIV testing services among NIDUs. Nevertheless, most of the drug users were reluctant to register as a drug user due to several barriers, including stigma toward drug addicts, financial problems (Appel, Ellison, Jansky, & Oldak, 2004), fear of being known as a drug user, perceived low efficacy of available treatment, and the possibility of losing employment opportunities (Bobrova et al., 2006; Tucker, 2001). Another important finding was that NIDUs who were of Shan or Kachin ethnicities were less likely to have tested their HIV status than were those of Burma ethnicity. It may be because most of the IEC materials, HIV testing

		information, and HIV counseling services were conducted in Myanmar language, which Shan and Kachin ethnicities were not always familiar with. Participants who do not speak or read Myanmar language may have had difficulty in accessing HIV testing services. If HIV testing services were offered in other languages for minorities such as Shan and Kachin, they would be better able to make use of those services.	
Key results	18	**Summarise key results with reference to study objectives** Both IDUs and NIDUs who had ever received drug treatment were more likely to have tested for HIV. More IDUs received HIV testing compared to NIDUs. Low HIV testing rates were found among IDUs who were married and who injected twice per day and among NIDUs reporting poly drug use within the last three months and who were of Kachin or Shan ethnicity. To increase HIV testing rate especially among NIDUs, we need to encourage them to register as a drug users and providing them with HIV services in Myanmar language as well as in ethnic languages. Integrating HIV testing into drug treatment and expanding drug treatment services is an effective way to increase utilization of HIV testing among both types of drug users in Myanmar.	16
Limitations	19	**Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias** Our findings are derived from a cross-sectional study, and several possible limitations of these findings should be noted. First, HIV testing was self-reported by drug users, and we were not able to confirm their HIV status. Second, the lack of indentified significant correlates of HIV testing may be due to insufficient sample size for the required statistical power or loss of information resulting from dichotomization of covariates. Despite these potential methodological limitations, these results present the first look at HIV testing behaviors among drug users in Lashio, the famous border trade city with a high burden of HIV infection. Further research is needed to understand barriers and decisions to access HIV testing among drug users especially for those who are married and engaged in risk behaviors.	16
Interpretation	20	**Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence** Results may need to be carefully interpreted as drug users from other cities from Myanmar may have different characteristics. However, IDUs who had ever received both pharmacological and psychological treatments were more likely to have tested for HIV than were those who underwent only one kind of treatment in Italy (Camoni et al., 2011) and female sex workers from Vietnam who spent time in a rehabilitation center were more likely to have tested for HIV (Grayman et al., 2005). Drug treatment is playing an important role to reduce risk of HIV infection among both drug users (CDC, 2002). However, HIV testing is not currently a compulsory service at drug treatment centers in Myanmar unless a drug user undergoing detoxification requests it. Since HIV testing and counseling effectively reduce risk behaviors in drug using populations, the United States Centers for Disease Control and Prevention recommends that HIV testing should be integrated into drug treatment services (CDC, 2002). Expanding drug treatment to incorporate HIV testing services may increase the number of IDUs and NIDUs accessing HIV testing services in Myanmar, too.	12 to 13
Generalisability	21	**Discuss the generalisability (external validity) of the study results** Our results may not be generalized to drug users in other cities, as both IDUs and NIDUs from other parts of Myanmar may have different characteristics than those in Lashio.	

Other information			
Funding	22	This study has received funding from the University of Tokyo and the ITO foundation (G 0114) of Tokyo.	17

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.