

Shared Drug Injection inside Prison as a Potent Associated Factor for Acquisition of HIV Infection : Implication for Harm Reduction Interventions in Correctional Settings

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Introduction

Iran has faced a rapidly growing HIV/AIDS epidemic particularly among injecting drug users (IDUs). Since 1987, more than 15,500 cases of HIV/AIDS have been reported to the Center for Disease Management with an additional 2,000 AIDS patients dying of the disease. More than 94% of HIV/AIDS reported cases are male. Among those with a known transmission route, 87% were IDUs and 9% reported acquiring the infection through sexual contact¹⁾. Reports show that the number of people with HIV/AIDS has been sharply increasing in recent years²⁾ and an estimate in 2006 indicates that more than 66,000 people with HIV/AIDS are living in Iran^{1,3)}.

Although opium smoking has a centuries-old tradition in Iran, increased availability of heroin, along with its low price in recent years, has led to an explosion of heroin dependency and its injecting use. According to the rapid situation assessment conducted in 1999, there were 1.8 million drug users in Iran of which 9-16% practiced injecting drugs, giving an estimated number of 200,000 IDUs in Iran⁴⁾. The epidemic of injecting drug use in Iran should not only be examined at a national level but also in the wider regional context in that Iran's neighboring country, Afghanistan, is the main producer of opium in the world⁵⁾ and drugs have been heavily trafficked to Iran and through Iran to other

countries⁶⁾. According to the World Drug Report by the United Nations Office for Drugs and Crime (UNODC), opium production is now highly concentrated in Afghanistan's southern provinces especially in Helmand province, with the dubious distinction of more drug cultivation than entire countries such as Myanmar, Morocco or even Colombia⁷⁾.

At the same time, drug-related offences are abundant in Iran, with a report in 2001 showing that over 300,000 individuals were arrested on drug-related charges and the number of people convicted of drug-related offences constitutes 47% of the total prison population in Iran⁸⁾. Though the average number of prisoners in Iran has been moderately reduced in recent years, there is still a high turn over of prisoners entering and exiting prisons⁸⁾. The Iran Prisons Organization reports that there were, on average, 135,000 prisoners in 230 prisons and correctional settings at any point in time in Iran during the 2004 to 2005 Persian fiscal year, and about 600,000 prisoners entered and exited prisons during this period⁸⁾.

In response to the intertwined epidemics of HIV infection and injecting drug use, Iranian health policy makers have adopted a harm reduction approach and have initiated a number of interventions to control further transmission of HIV infection among the large IDU population⁸⁻¹¹⁾. Notably, tri-angular clinics (where integrated services are provided to IDUs, people living with HIV/AIDS and sexually transmitted infections (STIs)¹²⁾ have been expanding across the country; methadone maintenance therapy (MMT) is now being scaled up in community and correctional settings; an integrated bio-behavioral HIV surveillance has been set up for IDUs; and there is greater involvement of non-governmental organizations (NGOs) in HIV preven-

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tion among IDUs including outreach and needle and syringe programs through drop-in centers^{3,11,13}.

While there have been a range of HIV prevention interventions for IDUs in Iran, at the time of our investigation, there was little available data on HIV prevalence or its risk factors in Iran. Consequently, a collaborative research project (called the HADI Project) was established between Department of Global Health and Socio-epidemiology at Kyoto University School of Public Health in Japan and the Center for Disease Management at Ministry of Health in Iran to investigate HIV prevalence and behavioral and contextual risk factors of the infection among drug users in Iran. The project later found another major collaborating partner at Nagoya City University in Japan, and other research partners including the Iranian National Center for Addiction Studies and the Persepolis Society in Iran.

This article reviews the overall findings of phase I and phase II of the HADI Project and further discusses the impacts of these findings on health policy relating to incarcerated drug users in Iran. Further details of the study methods and results can be found in the original research reports^{14,15}.

Methods

This research project is an example of socio-epidemiological studies^{16,17} in which qualitative and quantitative methodologies are integrated in order to produce a clearer insight into health conditions within a complex social context. An obvious example is the transmission of HIV and other blood-borne infections among injecting drug users whose sub-cultures and social life are relatively unknown to the researchers. In this research project, a sequential strategy was used, starting with a preliminary qualitative phase and then followed by a main quantitative phase, which was given greater priority or weight in the final analysis and in related policy reports. However, qualitative inquiries were effectively applied in preliminary work to obtain a deeper insight into the living conditions of drug users, their norms and sub-culture in regard to HIV risk-related behaviors. Based on the results of the preliminary qualitative phase, the overall plan for the quantitative phase was finalized and a culturally-sensitive questionnaire was developed.

Participants and settings

Phase I.

Between late October 2003 and May 2004, drug users attending three public out-patient drug treatment centers in Tehran were recruited into the study. Drug users were eligible for participation if they had used illicit drugs during the previous month, and were seeking drug treatment for the first time in those centers. The

recruitment sites were public drug treatment centers, each representing a subdivision of out-patient health facilities for drug users organized by the Ministry of Health or the State Welfare Organization.

Phase II.

The survey was conducted in the *Shoosh* area in south-central Tehran, a relatively poor area where there is a high concentration of migrants and drug users¹⁵. In October 2004, a further sample of drug users was recruited at the drop-in center and at parks and streets in the area.

Data collection

After obtaining informed consent, each respondent was confidentially interviewed by an experienced interviewer using a structured questionnaire. The questionnaire was developed from a questionnaire produced by Family Health International for use with IDUs¹⁸. Modifications to the original questionnaire were made following the findings of the preliminary qualitative study conducted among 19 drug users. The revised questionnaire was pre-tested for its reliability and those questions producing inconsistent responses were excluded.

HIV testing

On completion of the 20-minute long interview, consenting participants were counseled and then the trained interviewer took an oral mucosal transudate sample. In addition to information given during the counseling, participants received an educational pamphlet and a confidential code for receiving the oral HIV test result.

Oral samples were obtained using the OraSure oral fluid specimen collection device (OraSure Technologies, Inc., Beaverton, OR, USA). Collected samples were kept cool until shipped in batches to Nagoya City University of Japan for testing. All samples were tested for HIV-1 with ELISA (Oral Fluid Vironostika HIV-1 Microelisa System, BioMérieux Inc, Durham, NC, USA). Repeatedly reactive ELISA samples were confirmed using a Western blot test (OraSure HIV-1 Western Blot Kit, OraSure Technologies, Inc. Oregon, USA)¹⁹.

Ethical issues

The protocol used in this research was approved by the Ethics Committee in Medical Sciences Research in the Ministry of Health, the Ethics Committee in the National Center for Addiction Studies in Iran and by the Committee for Research on Human Subjects at Kyoto University in Japan. Separate informed consents were obtained for the interview and HIV testing, and no personal identifier was recorded on the questionnaires.

Statistical analysis

Statistical analysis was performed using SPSS for Windows® (version 12.01). Bivariate analyses were performed to determine associations between HIV status

Table 1. Characteristics of male injecting drug users recruited from treatment centers and community-based settings in Tehran between 2003 and 2004, divided by recruitment setting ($n=372$)

Characteristic	Phase I of HADI Project	Phase II of HADI Project
	Mean (SD) or Number (%)	Mean (SD) or Number (%)
Overall	165	207
Recruitment setting	Treatment-based	Community-based
Period of data collection	Oct. 2003 to May 2004	Oct. 2004
Mean age at interview (SD)	31.0 (7.8)	33.3 (8.1)
Mean age at first drug use (SD)	18.7 (4.4)	19.0 (4.3)
Mean age at first drug injection (SD)	26.0 (6.7)	25.4 (6.2)
Infected with HIV (%)	25 (15.2)	48 (23.2)
Ever incarcerated (%)	105 (63.6)	194 (94)
<i>Among incarcerated IDUs</i>		
Ever used drugs inside prison (%)	46 (43.8)	121 (62.4)
Ever injected a drug inside prison (%)	19 (18.1)	55 (28.4)
Ever injected a drug using a shared tool inside prison (%)	19 (18.1)	45 (23.2)

SD, standard deviation; IDUs, injecting drug users.

and self-reported characteristics, followed by logistic regression analyses. Variables were entered into a multivariate model if their association with HIV infection by bivariate analysis had a P value ≤ 0.10 or if they were considered epidemiologically important. A multivariate model was used to obtain adjusted odds ratio (OR) and 95% confidence interval (CI) for the associated factors with HIV infection.

Results

The main findings for injecting drug users with HIV test results are summarized in Table 1. Overall, information from 372 male IDUs (those who reported having ever injected an illicit drug in their lifetime) participated into these two surveys, 165 were recruited from treatment based settings during first phase of the study in 2003-4 and 207 community-based IDUs participated in the second phase conducted in 2004.

As shown in the Table 1, the mean age of male IDUs who were recruited from treatment centers was 31.0 [standard deviation (SD)=7.8] at the time of interview and they reportedly started drug injection on average at 26 (SD=6.7) years of age. For IDUs from community-based settings these figures were 33.3 (SD=8.1) and 25.4 (SD=6.2), respectively.

The majority of IDUs in both surveys reported that they were using heroin as the main injecting drug. Among treatment based IDUs, about 64% reported having been incarcerated and among those with a history of incarceration, 44% reported using drugs inside prison and 18% reported practicing drug injection inside prison. Notably, all of those with a history of

drug injection inside prison reported that at some point in time, they had shared drug injection tools (needle/syringe or hand-made device) there. The incarceration history was more evident among community-based IDUs and 94% of them reported having been incarcerated. Among those community-based IDUs with a history of incarceration, 62% reported using drugs at some time inside prison, 28% practiced drug injection inside prison and 23% reported using shared drug injection tools while inside prison.

Prevalence of HIV infection was 15.2% among IDUs who visited treatment centers but the infection rate was as high as 23.2% among community-based IDUs who were recruited from a drop-in center and its neighboring parks and streets.

Associated factors with HIV infection among IDUs recruited from treatment centers

There was no significant difference in HIV prevalence by age at first injection, by period of injection history, or by time elapsing from last injection. However, total length of lifetime incarcerations was found to be associated with higher prevalence of HIV infection in a dose-dependent manner as the odds ratio increased from 3.24 among IDUs who had experienced incarceration of less than 6 months to 8.38 in those who had been incarcerated for six months or more compared to those who never incarcerated. Those IDUs with a history of sharing injection equipment inside prison had a much higher HIV prevalence compared to those who had never had a shared drug injection tools (OR=10.00, 95% CI : 3.23-30.94), while HIV prevalence among IDUs with a history of sharing injection tools only

Table 2. Multivariable analysis on the association between HIV infection and risk characteristics of injecting drug users visiting public drug treatment centers in Tehran, Iran, 2003-4

Characteristics	Adjusted odds ratio	95% CI	P value
Jobless	2.7	0.9- 8.6	0.082
Injected using a shared needle/syringe but never inside prison ¹	2.4	0.8- 7.8	0.131
Injected using a shared tool inside prison ¹	12.4	2.9-52.0	0.001
Months of incarceration (continuous)	1.0	0.9- 1.0	0.233
Years of injecting (continuous)	1.1	0.9- 1.3	0.105

Variables shown in this model are controlled for age, ethnicity, level of education, and marital status.

¹ Reference group consists of those never had a shared drug injection.

CI, confidence interval.

From Zamani *et al.* AIDS 19 : 709-716, 2005.

Table 3. Multivariable analysis on the association between HIV infection and risk characteristics of injecting drug users recruited from a drop-in center and its neighboring area in Tehran, Iran, 2004

Characteristics	Adjusted odds ratio	95% CI	P value
Injected using a shared tool in prison	2.3	1.0-5.2	0.050
History of multiple incarcerations	3.1	1.1-8.9	0.038
Engaged in sex with another man	0.5	0.1-2.1	0.349
Tattooed inside prison	1.4	0.7-2.9	0.396

Variables shown in this table are controlled for age, levels of education, marital status, job status and number of years of drug injection.

CI, confidence interval.

From Zamani S, *et al.* J Acquir Immune Defic Syndr 42 : 342-346, 2006.

outside prison was not significantly higher than those who had never shared ($P=0.099$) (Not shown in the table)¹⁴.

In the multivariate analysis conducted on the data for male IDUs controlling for basic demographics, a history of sharing injection equipment inside prison remained the major factor associated with HIV infection (adjusted OR 12.37, 95% CI 2.94-51.97) (Table 2)¹⁴. **Factors associated with HIV infection among community-based IDUs recruited from a drop-in center and its neighboring area**

Among community-based IDUs, the prevalence of HIV infection was associated with the number of incarcerations and with the total length of incarcerations in a dose-dependent manner. Those who reported having injected a drug inside prison using a shared injection tool had a significantly higher prevalence of HIV compared to those who did not (36% v 20%, $P < 0.05$)¹⁵.

In the multivariable analysis controlling for basic socio-demographics, it was shown that HIV infection was associated with a history of sharing drug injection

tools inside prison (adjusted OR, 2.3 ; 95% CI, 1.0-5.2) and of having had multiple incarcerations (adjusted OR, 3.1 ; 95% CI, 1.1-8.9) (Table 3)¹⁵.

Discussion

Despite the increasing number of HIV/AIDS cases in Middle Eastern countries, there have been few epidemiological studies providing evidence relating to the prevalence of HIV infection and characteristics of at-risk populations in this region²⁰. Through these studies, we investigated HIV prevalence and risk characteristics of IDUs recruited from drug treatment centers and those from a community-based drop-in center and its neighboring parks and streets in Tehran, Iran. Both studies showed that HIV infection was already prevalent among both groups at alarming levels and the infection was strongly associated with a history of sharing drug injection tools while inside prison.

The increased risk of HIV infection among incarcerated drug users is not confined to Iran and has been reported in several other countries. Similar findings have been reported in Thailand, where drug in-

jecting inside prison was shown to be a potent correlate of HIV infection among incarcerated drug users²¹. In Berlin, IDUs were recruited from different settings and data on risk behavior were obtained along with serological markers including that for HIV infection. In this study, it was found that a history of syringe sharing in prison was potentially associated with HBV, HCV and HIV infection²². In 1993, Taylor *et al.* conducted an investigation in response to an HIV outbreak in Glenochil Prison in Scotland that indicated some of HIV transmissions definitely occurred within that prison²³. The authors, who were examining one of the first outbreaks of HIV infection occurring within a prison, concluded that restricted access to injecting equipment resulted in random sharing and placed injectors at high risk of becoming infected with HIV²³.

The association between HIV infection and a history of shared drug tools inside prison in Iran is also supported by our qualitative data which showed that while drugs can be found in some prisons, they are much more expensive than those purchased outside prison in Iran. Having obtained an expensive drug inside prison, the most cost effective way of drug use is by injection. On the other hand, lack of sterile needles/syringes inside prisons may lead IDUs to share hand-assembled injecting tools with a large number of partners²⁴. This intense sharing practice with hand-assembled injection tools that can be hard to disinfected can put incarcerated IDUs at a great risk of HIV infection as well as other blood-borne infections such as HBV and HCV²⁵.

Our findings strongly suggest that the Iranian government should be compelled to undertake HIV preventive interventions for incarcerated drug users, given the high prevalence of HIV infection among those IDUs who reported sharing drug injection tools inside prison. Cumulative evidence from other countries and that of national studies in Iran showed a greater risk of HIV infection for incarcerated drug users needs urgent and comprehensive attention^{14,15}. In January 2005, in response to increasing concern over HIV transmission among IDUs and prisoners, the head of the Iranian judiciary issued an executive order to judges in all courts of justice in favor of further provision of sterile injection equipment and MMT for IDUs and incarcerated people²⁶. Authorities in the judiciary system and its sub-division Prison Organization have, in fact, adopted harm reduction policies and practices for drug using inmates in Iran. As a result, the Iran Prison Organization has started comprehensive HIV prevention interventions for drug using inmates in many provinces in Iran including epidemiological surveillance, educational programs, research activities, and prevention programs. One of the key elements of prevention programs inside prisons in Iran is to reduce HIV-related

harm through MMT⁸). While the Iran Prison Organization is intensively scaling up its prevention interventions for drug using inmates, it is very important that these interventions become available in all prisons in Iran and that they become more coordinated with and integrated into existing public health interventions for drug users and ex-prisoners in the community outside of prisons.

These two studies had some limitations. Firstly, our participants are unlikely to be representative of the general drug using population as they were recruited from three treatment centers and from a drop-in center and its neighboring area in Tehran. We mainly relied on self-reported risk behaviors which could be biased as a result of recall ability, or social desirability^{27,28} given the social context where many of the HIV risk behaviors are highly stigmatized.

Conclusions

Our findings show that HIV prevalence has reached high proportions among community-based IDUs in Tehran with incarceration-related exposures revealed to be the main correlates of the infection. Urgent and comprehensive harm reduction programs for drug users in prison as well as those in the community are needed if the epidemic among IDUs in Iran is to be controlled.

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References

- 1) Center for Disease Management, Ministry of Health and Medical Education : AIDS/HIV Surveillance Report (April 2004). Tehran, Iran, 2004.
- 2) MAP Network : AIDS in Asia : Face the Facts—A Comprehensive Analysis of the AIDS Epidemic in Asia. Monitoring the AIDS Pandemic (MAP) Network, 2004.
- 3) UNAIDS : Country Situation Analysis-Islamic Republic of Iran, 2007. http://www.unaids.org/en/Regions_Countries/Countries/Iran_Islamic_Republic_of.asp (accessed August 1, 2007).
- 4) Razzaghi E, Rahimi A, Hosseini M, Chatterjee A : Rapid Situation Assessment (RSA) of Drug Abuse in Iran. Prevention Department, State Welfare Organization, Ministry of Health, I.R. of Iran and United Nations

- International Drug Control Program, 1999.
- 5) UNODCCP : Afghanistan Opium Survey (October 2002). United Nations Office for Drug Control and Crime Prevention. Vienna, 2002.
 - 6) UNODC : Drug Situation in the I.R. of Iran. United Nations Office on Drugs and Crime Tehran Office, Iran ; 2002.
 - 7) UNODC : World Drug Report. Vienna : United Nations Office on Drugs and Crime, 2007.
 - 8) Iran Prison Organization, Health and Treatment Headquarter : An overview on HIV/AIDS in prisons of Islamic Republic of Iran (In Persian). Iran Prison Organization Document, 2006.
 - 9) Razzaghi E, Nassirimanesh B, Afshar P, Ohiri K, Claeson M, Power R : HIV/AIDS harm reduction in Iran. *Lancet* 368 : 434-435, 2006.
 - 10) Vazirian M, De Kort G, Nassirimanesh B : Young people and drugs—Towards a comprehensive health promotion policy—Tehran report. Asian Harm Reduction Network, UNODC, Ministry of Health and Medical Education, Iran, 2006.
 - 11) Vazirian M : Review of drug demand reduction programs in Iran : Advices for development and strategic planning. *Social Welfare Quarterly* (in Persian), 9 : 145-201, 2003.
 - 12) WHO, Regional Office for the Eastern Mediterranean : Best practice in HIV/AIDS prevention and care for injecting drug abusers : the triangular clinic in Kerman-shah, Islamic Republic of Iran, 2004.
<http://www.emro.who.int/asd/PDF/STD-052.pdf> (accessed August 1, 2007).
 - 13) Vazirian M, Nassirimanesh B, Zamani S, Ono-Kihara M, Kihara M, Mortazavi Ravari M, Gouya MM : Needle and syringe sharing practices of injecting drug users participating in an outreach HIV prevention program in Tehran, Iran : A cross-sectional study. *Harm Reduction Journal* 2, 19 doi : 10.1186/1477-7517-2-19, 2005.
 - 14) Zamani S, Kihara M, Gouya MM, Vazirian M, Ono-Kihara M, Razzaghi EM, Ichikawa S : Prevalence of and factors associated with HIV-1 infection among drug users visiting treatment centers in Tehran, Iran. *AIDS* 19 : 709-716, 2005.
 - 15) Zamani S, Kihara M, Gouya MM, Vazirian M, Nassirimanesh B, Ono-Kihara M, Ravari SM, Safaie A, Ichikawa S : High prevalence of HIV infection associated with incarceration among community-based injecting drug users in Tehran, Iran. *J Acquir Immune Defic Syndr* 42 : 342-346, 2006.
 - 16) 木原正博, 木原雅子 : HIV 感染症の社会疫学. *現代医療* 35 (1) : 60-64, 2003.
 - 17) Kihara M, Ono-Kihara : Description of Socio-epidemiology in Global Health and Socio-epidemiology, 2007.
http://www.med.kyoto-u.ac.jp/E/grad_school/introduction/1706/ (accessed August 1, 2007).
 - 18) FHI : Behavioral Surveillance Surveys : Guidelines for Repeated Behavioral Surveys in Populations at Risk of HIV. Family Health International, Virginia, 2000.
 - 19) Gallo D, George JR, Fitchen JH, Goldstein AS, Hindahl MS : Evaluation of a system using oral mucosal transudate for HIV-1 antibody screening and confirmatory testing. *JAMA* 277 : 254-258, 1997.
 - 20) Jenkins C, Robalino DA : HIV/AIDS in the Middle East and North Africa. The Cost of Inaction. Washington, D.C. : The World Bank, 2003.
 - 21) Vanichseni S, Kitayaporn D, Mastro TD, Mock PA, Raktham S, Des Jarlais DC, Sujarita S, Srisuwanvilai LO, Young NL, Wasi C, Subbarao S, Heyward WL, Esparza L, Choopanya K : Continued high HIV-1 incidence in a vaccine trial preparatory cohort of injection drug users in Bangkok, Thailand. *AIDS* 15 : 397-405, 2001.
 - 22) Stark K, Bienzle U, Vonk R, Guggenmoos-Holzmann I : History of syringe sharing in prison and risk of hepatitis B virus, hepatitis C virus, and human immunodeficiency virus infection among injecting drug users in Berlin. *Int J Epidemiol* 26 : 1359-1366, 1997.
 - 23) Taylor A, Goldberg D, Emslie J, Wrench J, Gruer L, Cameron S, Black J, Davis B, McGregor J, Follett E : Outbreak of HIV infection in a Scottish prison. *BMJ* 310 : 289-292, 1995.
 - 24) Zamani S, Kihara M, Ono-Kihara M, Goya M, Razzaghi E, Vazirian M, Yamazaki H, Mostashari G, Mojtahedzadeh V : A qualitative study on drug abusers' risk behaviors and attitudes toward HIV/AIDS in Iran. Presented at : the 15th International Conference on the Reduction of Drug Related Harm ; 2004 ; Melbourne.
 - 25) Zamani S, Ichikawa S, Nassirimanesh B, Vazirian M, Ichikawa K, Gouya MM, Afshar P, Ono-Kihara M, Ravari SM, Kihara M : Prevalence and correlates of hepatitis C virus infection among injecting drug users in Tehran. *Int J Drug Policy* (in press), 2007.
 - 26) IHRD : Harm Reduction Developments 2005 : Countries with Injection-Driven HIV Epidemics. New York : International Harm Reduction Development Program (IHRD) of the Open Society Institute. 2006.
 - 27) Latkin CA, Vlahov D, Anthony JC : Socially desirable responding and self-reported HIV infection risk behaviors among intravenous drug users. *Addiction* 88 : 517-526, 1993.
 - 28) De Irala J, Bigelow C, McCusker J, Hindin R, Zheng L : Reliability of self-reported human immunodeficiency virus risk behaviors in a residential drug treatment population. *Am J Epidemiol* 143 : 725-732, 1996.



Short report

Prevalence and correlates of hepatitis C virus infection among injecting drug users in Tehran

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Abstract

This study aimed to investigate the prevalence and correlates of hepatitis C virus infection among injecting drug users in a community-based setting in Tehran, Iran. In October 2004, injecting drug users were recruited from a drop-in centre and neighboring parks and streets in a drug-populated neighborhood in Tehran. Participants were interviewed using a structured questionnaire, and a sample of oral mucosal transudate was collected for detection of HIV and HCV antibodies. Overall, 105 of 202 participants (52.0%) were found to be positive for HCV-antibody testing. After adjustment for the basic demographic characteristics, the prevalence of HCV infection was found to be associated with length of drug injection (more than 10 years) [odds ratio (OR), 3.25; 95% confidence interval (CI), 1.43–7.38], length of lifetime incarcerations (more than a year) (OR, 3.44; 95% CI, 1.68–7.06), and a history of being tattooed inside prison (OR, 1.96; 95% CI, 1.06–3.62). High prevalence of HCV infection and its association with incarceration-related exposures are important implications for harm reduction initiatives for drug using inmates in Iran. While prevention interventions for drug using inmates are being expanded in Iran, it is important that high prevalence of HCV infection be taken into consideration in order to control further transmission of this infection.

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Keywords: Hepatitis C virus; Substance use; Tattoo; Prison

Background

Hepatitis C virus (HCV) is a major public health problem in the world. While it is preventable, the infection can cause chronic HCV infection which may then develop into cirrhosis or hepatocellular carcinoma. Recent data shows that HCV infection is prevalent among estimated 180 million people, representing some 3% of the world's population (World Health Organization, 2006). Available evidence from Iran shows that prevalence of HCV infection ranges between

0.12% (Alavian, Gholami, & Masarrat, 2002) and 0.59% (Ghavanini & Sabri, 2000) among blood donors.

It is known that injecting drug use is a primary mode of transmission for HCV in developed countries but there is limited evidence regarding the contribution of drug injecting to HCV transmission in developing countries (Shepard, Finelli, & Alter, 2005). However, there are several studies in Iran showing that injecting drug use is one of the main factors associated with the prevalence of HCV infection (Alavian et al., 2002; Hajiani et al., 2006). Several research studies have also reported that HCV is prevalent among prisoners in Iran. Accordingly, prevalence of HCV infection among prisoners with a history of drug injecting varies between 31.5%

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(Mohammad Alizadeh, Alavian, Jafari, & Yazdi, 2005) and 45.3% (Zali, Aghazadeh, Nowroozi, & Amir-Rasouly, 2001). In another study in Zanjan prison, it was found that more than 47% of inmates were infected with HCV infection (Khani & Vakili, 2003). These studies showed that risk characteristics including injecting drug use, homosexual sexual practice, tattooing, and length of incarceration are among potential correlates of HCV infection among prisoners in Iran. It is also predicted that prison-based sharing practices could exacerbate levels of HCV infection, given the current situation of injecting drug users (IDUs) in Iran (Alavian, Adibi, & Zali, 2005).

While it has been known that HIV infection is potentially associated with a history of shared drug injection inside prison (Zamani et al., 2005, 2006) there has been contention surrounding the possible association between incarceration-related risk behaviors and other blood-borne infections such as HCV infection among drug users in Iran. In this study, we have defined factors associated with HCV infection among a group of community-based IDUs in Tehran and provide data surrounding additional contextual factors for the risk of HCV infection that could potentially be incorporated into current and future harm reduction initiatives for IDUs in Iran.

Methods

This survey was conducted in a relatively poor residential neighborhood in south central Tehran (*Shoosh* area) which is also home to high proportions of migrants and drug users (Razzaghi & Rahimi Movaghar, 2003; Vazirian et al., 2005). In October 2004, a consecutive sample of drug users was recruited at a drop-in centre and at parks and streets in the area. Potential respondents were approached by an ex-user staff member of Persepolis NGO for recruitment into the study. After being screened by a researcher, active drug users (those who reported using drugs in the past month) were interviewed using a structured questionnaire. On completion of the interview, the trained researcher took an oral mucosal transudate (OMT) sample from consenting participants. Oral samples were obtained using the OraSure oral fluid specimen collection device (OraSure Technologies Inc., Beaverton, Ore) and were shipped to Japan to be tested for the presence of antibodies for HIV-1 and HCV. All samples were tested for anti-HCV antibodies by particle agglutination (PA) assay (Serodia-HCV, FujiRebio, Tokyo, Japan) and end-point dilution antibody titers were determined by 5- μ l PA assay (Mizui et al., 1994).

The research protocol was approved by the Ethical Committee of the Iranian National Center for Addiction Studies at Tehran University of Medical Sciences in Iran and by the Committee for Research on Human Subjects at Kyoto University in Japan. After interviewing, respondents were invited to undertake HIV and HCV testing, and were given information regarding prevention of HIV and other blood-borne infections. Statistical analysis was performed using

SPSS for Windows (Version 13.0; SPSS Inc., Chicago, IL, USA). Multivariable analysis was performed to examine the associations of variables with being HCV positive, simultaneously adjusting only for basic demographic characteristics, and to estimate adjusted odds ratios (OR) and 95% confidence intervals (CI).

Results

Of the 302 drug users who were invited to participate in the study, two men refused to be interviewed (response rate 99.3%) and 14 cases were later excluded either because of incomplete questionnaire or insufficient oral sample. Among the remaining, 202 drug users reported ever using a drug by injection (IDUs) and their information was then considered for this report. Among 202 IDUs, 105 (52.0%) were found to be positive for HCV antibodies using oral samples. Of those infected with HCV infection, 19 (9.4%) were co-infected with HIV-1 infection.

As shown in Table 1, the majority of participants were male and were mainly recruited from a drop-in centre. The median age of drug using participants was 32.0 and 60% of them were of Fars ethnicity. Up to 75% of drug users had educational levels less than high school and about 59% had ever been married. At the time of interview, one third of the respondents were homeless and 66% had no job. None of

Table 1
Socio-demographic characteristics of injecting drug users recruited from a drop-in centre and neighboring area in Tehran in 2004 ($n = 202$)

Characteristics	Number (%)
Recruitment site	
Drop-in center	148 (73.3)
Park/street/abandoned building	54 (26.7)
Gender	
Male	196 (97.0)
Female	6 (3.0)
Age at interview	
<30 years	70 (34.7)
≥ 30 years	132 (65.3)
Ethnicity	
Fars	122 (60.4)
Others	80 (39.6)
Education	
Junior high school or less	152 (75.2)
High school or more	50 (24.8)
Marital status	
Single (never married)	83 (41.1)
Ever married	119 (58.9)
Place of residence	
Residential place	136 (67.7)
Park/street/abandoned building	65 (32.3)
Job situation	
Have a job	69 (34.2)
Jobless	133 (65.8)

Table 2
Risk characteristics of injecting drug users recruited from a drop-in centre and neighboring area in Tehran in 2004, by HCV test results ($n = 202$)

Characteristics	No.	HCV positive (%)	Adjusted OR (95% CI)	<i>p</i> value
Overall	202	105 (52.0)	–	–
Time from last drug injection				
<6 months	181	93 (51.4)	1.00	
≥6 months	21	12 (57.1)	1.25 (0.48–3.25)	0.650
Length of drug injection				
<6 years	97	44 (45.4)	1.00	
6–10 years	39	20 (51.3)	1.50 (0.67–6.36)	0.327
>10 years	63	40 (63.5)	3.25 (1.43–7.38)	0.005
Ever shared a needle/syringe				
No	103	52 (50.5)	1.00	
Yes	99	53 (53.5)	1.18 (0.64–2.17)	0.660
Lifetime incarcerations				
0–6 months	61	22 (36.1)	1.00	
7–12 months	37	20 (54.1)	2.35 (0.98–5.65)	0.055
>12 months	102	63 (61.8)	3.44 (1.68–7.06)	0.001
Ever injected a drug inside prison				
No	147	74 (50.3)	1.00	
Yes	55	31 (56.4)	1.38 (0.67–2.83)	0.382
Ever had a shared drug injection inside prison				
No	157	82 (52.2)	1.00	
Yes	45	23 (51.1)	0.94 (0.44–2.02)	0.884
Ever tattooed inside prison				
No	118	56 (47.5)	1.00	
Yes	84	49 (58.3)	1.96 (1.06–3.62)	0.032

Variables shown in this table are controlled for basic demographic characteristics including gender, age, ethnicity, levels of education, marital status, job situation, residency status and recruitment site. OR, odds ratio; CI, confidence interval.

the above socio-demographic characteristics were associated with HCV infection.

Table 2 shows the association between some risk characteristics of IDUs and the prevalence of HCV infection, while being adjusted for basic demographic characteristics. Among IDUs, prevalence of HCV infection was associated with the length of lifetime injecting practice in a dose-dependent manner; the odds of being HCV positive among those IDUs who injected more than 10 years was 3.25 times (95% CI, 1.43–7.38) more than the odds of carrying the infection among IDUs who injected less than 6 years. However, HCV infection was not associated with time elapsed since last injection or a history of shared use of needle/syringe.

The prevalence of HCV infection was significantly associated with total length of incarcerations in a dose-dependent manner as the odds ratio increased from 2.35 among IDUs who had experienced incarceration of 7–12 months to 3.44 in those who had been incarcerated for more than 12 months compared with those who had never incarcerated or been in prison up to 6 months. Regarding risk behaviors inside prison, participants were asked whether or not they injected drugs, shared injecting utensils or been tattooed during any period of incarceration. Of these risk behaviors, only a history of being tattooed inside prison was significantly associated with higher prevalence of HCV infection ($p < 0.05$). This

association remained significant even when variables related to a history of ever shared drug injection or a history of shared drug injection inside prison was included into the model.

Discussion

In our previous report, we showed that the prevalence of HIV-1 infection was more than 23% and it was associated with a history of shared drug injection inside prison and that of multiple incarcerations (Zamani et al., 2006). In this report, we investigated the prevalence of HCV infection and its correlates among the same group of community-based IDUs in Tehran. These current results showed that more than half of the sample was infected with HCV and suggest that it is also associated with risk behaviors inside prison. However, unlike HIV infection, prevalence of HCV seems to be associated with being tattooed inside prison rather than shared drug injection.

The association between HCV infection and a history of being tattooed inside prison has been reported from other countries. In the United States, Samuel et al. (2001) reported that receipt of a tattoo inside prison or jail was associated with both hepatitis B and C viruses (OR 2.3 and 3.4, respectively). In Australia, it was also found that being tattooed

was an independent risk factor for being HCV positive (OR 2.7) among a group of prisoners (Hellard et al., 2004). The risk of tattooing for transmission of HCV infection has also been reported in earlier studies among IDUs in Iran (Zali et al., 2001), but our current results show contextual situations in which tattooing might have higher risk of HCV infection when practiced inside prison.

Facing the challenges regarding transmission of blood-borne infections, particularly HIV infection among IDUs and prisoners, authorities in the judiciary system and its Prison Organization sub-division have adopted and implemented comprehensive harm reduction policies and practices for drug using inmates. Accordingly, the Iran Prison Organization has started comprehensive HIV prevention interventions for drug using inmates in many provinces throughout the country. The main activities include epidemiological surveillance, educational programs, research activities, and prevention programs. Among HIV prevention interventions, methadone maintenance therapy is playing a key role inside prisons in Iran and being progressively expanded (Iran Prison Organization, 2006). While Iran Prison Organization is scaling up its prevention interventions for drug using inmates, it is helpful that these interventions further incorporate components such as HCV-specific educational programs and encourage inmates to avoid tattooing inside prison.

Our study had several limitations. The design of our study was cross-sectional which limits us from determining the exact temporal relationship between risk behaviors and any biological outcomes such as HCV infection. We also recruited drug users from one single drop-in centre and through outreach activities in its surrounding neighborhood, and thereby our findings may not be representative of wider drug injecting populations in Tehran. While detection of anti-HCV antibodies in oral samples has been more researched recently (De Cock et al., 2004; Judd et al., 2003), evaluation of oral samples using particle agglutination remains one of our important research questions to be investigated using both blood and oral samples.

In conclusion, our findings show that HCV is prevalent among community-based IDUs in Tehran with prison-related exposures among possible correlates of the infection. Comprehensive harm reduction programs targeting all blood-borne infections and different modes of transmission are needed for drug using inmates in Iran in order to best control further transmission of these infections.

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References

- Alavian, S. M., Gholami, B., & Masarrat, S. (2002). Hepatitis B and C virus infection: Hepatitis C risk factors in Iranian volunteer blood donors: A case control study. *Journal of Gastroenterology and Hepatology*, *17*, 1092–1097.
- Alavian, S. M., Adibi, P., & Zali, M. R. (2005). Hepatitis C virus in Iran: Epidemiology of an emerging infection. *Archives of Iranian Medicine*, *8*(2), 84–90.
- De Cock, L., Hutse, V., Verhaegen, E., Quoilin, S., Vandenberghe, H., & Vranckx, R. (2004). Detection of HCV antibodies in oral fluid. *Journal of Virological Methods*, *122*, 179–183.
- Ghavanini, A. A., & Sabri, M. R. (2000). Hepatitis B surface antigen and anti-hepatitis C antibodies among blood donors in the Islamic Republic of Iran. *Eastern Mediterranean Health Journal*, *6*, 1114–1116.
- Hajiani, E., Hashemi, J., Masjedizadeh, R., Shayesteh, A. A., Idani, E., & Rajabi, T. (2006). Seroepidemiology of hepatitis C and its risk factors in Khuzestan Province, south-west of Iran: A case-control study. *World Journal of Gastroenterology*, *14*, 4884–4887.
- Hellard, M. E., Hocking, J. S., & Crofts, N. (2004). The prevalence and risk behaviours associated with the transmission of hepatitis C virus in Australian correctional facilities. *Epidemiology and Infection*, *132*, 409–415.
- Iran Prison Organization, Health and Treatment Headquarter. (2006). An overview on HIV/AIDS in prisons of Islamic Republic of Iran (In Persian).
- Judd, A., Parry, J., Hickman, M., McDonald, T., Jordan, L., Lewis, K., et al. (2003). Evaluation of a modified commercial assay in detecting antibody to hepatitis C virus in oral fluids and dried blood spots. *Journal of Medical Virology*, *71*, 49–55.
- Khani, M., & Vakili, M. M. (2003). Prevalence and risk factors of HIV, hepatitis B virus and hepatitis C virus infections in drug addicts among Zanjan prisoners. *Archives of Iranian Medicine*, *6*, 1–4.
- Mizui, M., Moriya, T., Yoshizawa, H., Kondo, M., Saito, T., Imai, M., et al. (1994). A novel agglutination method for screening of HIV and HCV antibody testing with 5-microliters reagents: reduction of cost and time with high sensitivity. *VoxSang*, *67*, 315–316.
- Mohammad Alizadeh, A. H., Alavian, S. M., Jafari, K., & Yazdi, N. (2005). Prevalence of hepatitis C virus and its related risk factors in drug abuser prisoners in Hamedan-Iran. *World Journal of Gastroenterology*, *11*, 4085–4089.
- Razzaghi, E. M., & Rahimi Movaghar, A. (2003). *Rapid assessment and response: Multi-center project on injection drug use*. Tehran: WHO.
- Samuel, M. C., Doherty, P. M., Bulterys, M., & Jenison, S. A. (2001). Association between heroin use, needle sharing and tattoos received in prison with hepatitis B and C positivity among street-based injecting drug users in New Mexico, USA. *Epidemiology and Infection*, *127*, 475–484.
- Shepard, C. W., Finelli, L., & Alter, M. J. (2005). Epidemiology of hepatitis B and hepatitis B virus infection in United States children. *Lancet Infectious Disease*, *5*, 558–567.
- Vazirian, M., Nassirimanesh, B., Zamani, S., Ono-Kihara, M., Kihara, M., Mortazavi Ravari, M., et al. (2005). Needle and syringe sharing practices of injecting drug users participating in an outreach HIV prevention program in Tehran, Iran: A cross-sectional study. *Harm Reduction Journal*, *2*, 19. doi:10.1186/1477-7517-2-19
- World Health Organization. (2006). Hepatitis C. Retrieved 30th September 2006 from http://www.who.int/immunization/topics/hepatitis_c/en/print.html.

- Zali, M. R., Aghazadeh, R., Nowroozi, A., & Amir-Rasouly, H. (2001). Anti-HCV antibody among Iranian IV drug users: Is it a serious problem? *Archives of Iranian Medicine*, 4, 115–119.
- Zamani, S., Kihara, M., Gouya, M. M., Vazirian, M., Ono-Kihara, M., Razzaghi, M. E., et al. (2005). Prevalence of and factors associated with HIV-1 infection among drug users visiting treatment centers in Tehran, Iran. *AIDS*, 19, 709–716.
- Zamani, S., Kihara, M., Gouya, M. M., Vazirian, M., Nassirimanesh, B., Ono-Kihara, M., et al. (2006). High prevalence of HIV infection associated with incarceration among community-based injecting drug users in Tehran, Iran. *Journal of Acquired Immune Deficiency Syndrome*, 42, 342–346.

Prevalence and Correlates of Sexual Behaviors Among Karen Villagers in Northern Thailand

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Abstract A cross-sectional survey was conducted in two mountainous villages of the Karen, a major ethnic minority in Thailand. The participants were 566 villagers aged 15–54 years (371 in Village A, 195 in Village B; response rate=81.9%). Premarital/extramarital sex was experienced by 10–20% of the sexually active respondents and sex with a female sex worker (FSW) by 12.6% of males. Premarital sex was independently associated with being a Christian and occupational experience in town; extramarital sex was associated with Village A and drug use; sex with a FSW was associated with being unmarried, a nonfarmer, and occupational experience in town. Approximately 80% of the married participants never used a condom with their spouse, and nearly one-third never did so with a boy/girlfriend or a FSW. A history of sexually transmitted infections (STIs) was associated with sex with a FSW. These findings suggest that nontraditional sexual practices are prevalent and could potentially threaten Karen communities with the spread of HIV.

Keywords HIV · Sexual behaviors · Risk factors · Karen · Thailand

Introduction

Upper northern Thailand is one of the epicenters of HIV infection in Southeast Asia, although the new infection rate has declined in recent years (Torugsa et al., 2003; UNAIDS, 2004). The concentration of HIV prevalence in the region is often explained by the high infection rates of sexually transmitted infections (STIs) and HIV among female sex workers (FSWs; Limpakarnjanarat et al., 1999) and men's frequent visits to FSWs as clients (Celentano et al., 1996; Nopkesorn et al., 1993).

In this region, approximately 500,000 people belong to ten ethnic minorities that densely populate the mountainous areas (Department of Public Welfare, 1997). Each minority group has a different origin, culture, and language (Lewis & Lewis, 1998). These minorities have been left behind during the social and economic development that lowland Thais have enjoyed over the last 30 years, as a consequence of historical, cultural, linguistic, and geographical barriers, including political reasons. In recent years, however, following the increasing involvement of their societies with Thai society, the HIV infection risk of the ethnic minorities has begun to be studied.

Studies in the late 1990s compared the HIV prevalence, sexual attitudes, and behaviors of the villagers among several ethnic minorities (Beyrer et al., 1997; Omori, 1999). These studies demonstrated the presence of a major risk factor for HIV infection: contact with Thai society. Other studies have reported on HIV

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prevalence and high-risk behaviors associated with drug use in patients admitted to a drug treatment center in northern Thailand (Celentano, Jittiwutikorn, Hodge, Beyrer, & Nelson, 1998; Celentano et al., 1999; Razak et al., 2003; Wiewel et al., 2005). One study showed that contact with Thai society was a strong predictor of injection drug use. Although these studies provided important information regarding the risks for HIV infection among ethnic minorities, updated quantitative information on these risks and their social correlates are needed to develop appropriate HIV prevention programs for these populations.

In 2003, we conducted a cross-sectional survey of the Karen population, who comprise the largest ethnic minority in Thailand, to evaluate the prevalence and social correlates of sexual behaviors. The Karen have a unique, conservative sexual norm. They maintain their traditional sexual culture, including sexual sanctions based on animism, which regards premarital or extramarital sex as a transgression that is resolved in communal rituals. However, the communal ritual has declined gradually, not because there are no breaches of sexual sanctions, but with the influence of Christianity. Therefore, Christianity is thought to have weakened the sexual sanctions based on rituals (Hayami, 2003), which could make people vulnerable to STI/HIV infection.

We surveyed two Karen villages located in northern Thailand: a developed village and a less developed village. This was based on the assumption that social development contributed to high-risk sexual behavior because it facilitated contact with Thai society.

Method

Participants and Procedures

Villages in mountainous areas are classified into five categories from Category 1 to Category 5, depending on the level of social and economic development. Villages in Category 1 are the most developed, and those in Category 5 are the least developed (Department of Public Welfare, 1997). Since more than 90% of the Karen villages in the districts containing the two study sites are classified in Categories 1 to 3, we selected Village A from Category 1 as a developed village, and Village B from Category 3 as a less developed village. Village A, located 48 km from the nearest town, was first introduced to electricity in 1985, and a paved road linked it to the center of the province in 1995. Village B, located 43 km from the nearest town, has no such infrastructure.

All the male and female inhabitants (age range, 15–54 years) of both villages were recruited at their homes between 24 February and 26 March 2003. Six Karen health workers, three per village, interviewed candidates after explaining the study purpose, guaranteeing that there would be no consequences for refusing participation, and obtaining written informed consent. For adolescents, informed consent was also obtained from the parents. People who were illiterate were asked to give a mark for consent. Gender-matched interviewers conducted interviews when possible at an appropriate location near each respondent's home to protect privacy. Potential participants who were absent during three household visits were not recruited. Data were collected during a face-to-face interview using a structured questionnaire, with a separate self-administered answer sheet for sensitive questions. No names or other identifiers were collected. The consent form, questionnaire, and answer sheet were placed in an envelope and sealed in front of the participant.

Measures

Mini-focus group interviews were conducted for the participants from a developed and a less developed Karen village, which were distant from the study villages. Four focus groups were organized by gender (male or female) and age (15–34 or 35–54 years) in each village, with each group including four to five participants. A questionnaire was then developed in Thai based on the results of the mini-focus group interviews; it was pilot-tested outside the study sites, revised, and then translated into Karen. The questionnaire was translated from Thai into Karen after discussion with the Karen interviewers, who were bilingual in Karen and Thai. The questions covered basic demographics, experience in town, knowledge related to HIV and STIs, risk perception, attitudes toward nontraditional sexual practices, sexual behaviors, and drug use. There were 17 questions about HIV/STI knowledge, of which seven questions asked about the possibility of transmitting HIV by living together, eating food, having sex, or sharing a needle with people with HIV/AIDS (PWA), via mosquitoes or mother-to-child, or whether having a STI stimulated the transmission of HIV; five questions about prevention asked whether HIV could be prevented by using a condom correctly, sterilizing needles, having only one, healthy-looking, or faithful partner; and five questions about treatment asking if symptoms could indicate HIV status, whether a vaccine existed for preventing HIV/AIDS or a medicine that enabled complete recovery or prolonged the life of

PWA, or whether some STIs lacked symptoms. Self-risk perception was measured by asking whether it was possible that the respondent was infected with HIV. Concerning sexual attitude, five nontraditional sexual practices were presented and the respondents were asked if they found them agreeable: premarital or extramarital sex by males or females and sex with a FSW by males. A separate self-administered answer sheet for sensitive questions was also prepared. Considering illiterate respondents, illustrations and geometric patterns were used to indicate question numbers and selection numbers for answers instead of using Arabic numerals. Animals, insects, or plants commonly observed in the villages were used for illustrations; and white or black circles, triangles, and squares were used for geometric patterns.

Table 1 Sociodemographic characteristics of Karen survey participants by village and sex (%)

	Village A			Village B		
	Male (n = 177)	Female (n = 194)	Total (n = 371)	Male (n = 102)	Female (n = 93)	Total (n = 195)
Age group (years)						
15–24	44.6	44.8	44.7	35.3	34.4	34.9
25–34	26.6	26.3	26.4	27.5	36.6	31.8
35–44	20.3	24.7	22.6	24.5	21.5	23.1
45–54	8.5	4.1	6.2	12.7	7.5	10.3
Missing data	0.0	0.0	0.0	0.0	0.0	0.0
Marital status						
Single	44.6	24.2	34.0	36.3	22.6	29.7
Married	55.4	75.3	65.8	62.7	77.4	69.7
Other	0.0	0.5	0.3	1.0	0.0	0.5
Missing data	0.0	0.0	0.0	0.0	0.0	0.0
Religion						
Christianity	28.2	21.1	24.5	83.3	80.6	82.1
Buddhism	62.1	68.0	65.2	8.8	14.0	11.3
Animism	6.8	7.2	7.0	6.9	4.3	5.6
Missing data	2.8	3.6	3.2	1.0	1.1	1.0
Education						
No formal education	30.5	40.7	35.8	30.4	55.9	42.6
Not graduated from primary school	4.0	6.2	5.1	6.9	5.4	6.2
Primary school	22.6	17.5	19.9	39.2	18.3	29.2
Junior high school	22.6	21.1	21.8	12.7	9.7	11.3
High school or higher	19.8	12.4	15.9	10.8	9.7	10.3
Missing data	0.6	2.1	1.3	0.0	1.1	0.5
Primary occupation						
Farmer	61.6	72.2	67.1	81.4	86.0	83.6
Daily wage laborer	13.6	8.2	10.8	2.9	7.5	5.1
Student	12.4	10.3	11.3	14.7	5.4	10.3
Other	7.9	9.3	8.6	1.0	0.0	0.5
Missing data	4.5	0.0	2.2	0.0	1.1	0.5
Graduated from a school in town						
Yes	31.1	19.6	25.1	22.5	15.1	19.0
No	64.4	75.3	70.1	77.5	81.7	79.5
Missing data	4.5	5.2	4.9	0.0	3.2	1.5
Worked in town						
Yes	32.8	4.6	18.1	42.2	17.2	30.3
No	66.7	90.2	79.0	57.8	81.7	69.2
Missing data	0.6	5.2	3.0	0.0	1.1	0.5

Data Analyses

The χ^2 -test and Fisher's exact test were used to compare proportions, and a multiple logistic regression analysis was used to identify variables independently associated with outcomes. Variables that showed a correlation of $P < .1$ with at least one of the nontraditional sexual practices in the bivariate analyses were introduced in the multivariate analyses.

Results

Of 691 eligible inhabitants, 70 (15.9%) and 55 (22.0%) in Villages A and B, respectively, were excluded from the analysis due to their absence during the study

period or missing data on age, sex, or sexual behaviors. The final response rate was 84.1% for Village A and 78.0% for Village B, 81.9% in total.

Of the participants in both villages, more than 65% were younger than 34 years, two-thirds were married, 38.2% had no formal education, and the majority were farmers (see Table 1). The villages were markedly different in religious practices, $\chi^2(2, N = 522) = 174.2, P < .01$, but only moderately so in other variables; participants from Village B were less educated, more likely to be farmers, and had more experience working in town, $\chi^2(4, N = 545) = 15.2, P < .01$; $\chi^2(3, N = 557) = 23.8, P < .01$; $\chi^2(1, N = 554) = 10.0, P < .01$, reflecting the fact that inhabitants of Village B, having no private business in their village, had to seek job opportunities in town. There were large gender differences for marital status in Village A, $\chi^2(1, N = 371) = 17.2, P < .01$, and for occupational experience in town in both villages, Village A, $\chi^2(1, N = 360) = 46.8, P < .01$; Village B, $\chi^2(1, N = 194) = 14.0, P < .01$.

Table 2 describes the participants' HIV/STI-related knowledge, self-risk perception, attitudes toward non-traditional sexual practices, sexual experience, and

drug use. The knowledge score was calculated by summing the scores for all 17 questions by giving one point for each correct answer. Regarding sexual attitude, those who did not admit to any of the five non-traditional sexual practices were categorized in the conservative group and those who admitted to at least one non-traditional sexual practice were categorized in the nonconservative group. The self-risk perception was generally low and attitudes toward non-traditional sexual practices were predominantly conservative among both males and females. Most of the sexually active respondents were married, except for 12 males who comprised 10.3% of all single male respondents. Drug use was reported significantly more by males than by females, $\chi^2(1, N = 539) = 45.7, P < .01$. Amphetamine was used by 74.0% of the drug users, followed by opium (43.8%), marijuana (28.8%), and heroin (17.8%). Only one male reported injection drug use. There were no observed differences between the two villages in the prevalence and pattern of drug use.

Table 3 presents the prevalence of sexual behaviors and condom use among sexually active respondents, 97% of whom were married. The mean age at first

Table 2 HIV/STI knowledge, self-risk perception, sexual attitudes, sexual experience, and drug use of survey participants in two Karen villages (%)

	Village A			Village B		
	Male (n = 177)	Female (n = 194)	Total (n = 371)	Male (n = 102)	Female (n = 93)	Total (n = 195)
HIV/STI knowledge						
Lower score ^a (0–8)	24.9	52.6	39.4	26.5	45.2	35.4
Higher score ^a (9–17)	75.1	47.4	60.6	73.5	54.8	64.6
Missing data	0.0	0.0	0.0	0.0	0.0	0.0
Self-risk perception for HIV infection						
Possible to be infected	2.3	0.5	1.3	4.9	3.2	4.1
Not possible to be infected	87.0	95.4	91.4	91.2	95.7	93.3
Missing data	10.7	4.1	7.3	3.9	1.1	2.6
Sexual attitude						
Premarital sex with boy/girlfriend						
Nonconservative ^b	5.6	2.1	3.8	6.9	3.2	5.1
Conservative ^c	92.7	97.4	95.1	93.1	96.8	94.9
Missing data	1.7	0.5	1.1	0.0	0.0	0.0
Extramarital sex with other than a spouse ^d						
Nonconservative ^b	2.3	0.5	1.3	2.0	1.1	1.5
Conservative ^c	94.9	98.5	96.8	97.1	97.8	97.4
Missing data	2.8	1.0	1.9	1.0	1.1	1.0
Sex with FSW ^e						
Nonconservative ^b	3.4	0.5	1.9	3.9	1.1	2.6
Conservative ^c	92.7	99.0	96.0	93.1	95.7	94.4
Missing data	4.0	0.5	2.2	2.9	3.2	3.1
Sexual experience (lifetime)						
Yes	60.5	75.8	68.5	66.7	77.4	71.8
No	39.5	24.2	31.5	33.3	22.6	28.2
Missing data	0.0	0.0	0.0	0.0	0.0	0.0
Drug use ^f (last year)						
Yes	23.2	3.6	12.9	21.6	3.2	12.8
No	73.4	89.7	81.9	72.5	94.6	83.1
Missing data	3.4	6.7	5.1	5.9	2.2	4.1

^a Knowledge score is the total score for 17 true-or-false questions regarding knowledge about the transmission, prevention, and treatment of HIV/STI

^b Those who agreed to at least one traditional sexual behavior, that is, premarital sex, extramarital sex, or sex with a female sex worker

^c Those who never agreed to premarital sex, extramarital sex, and sex with a female sex worker

^d Sex with a female sex worker was excluded

^e FSW, female sex worker

^f Drugs include amphetamines, heroin, opium, and marijuana

Table 3 Sexual behavior and condom use of sexually active Karen survey participants by sex in two villages (%)

		Village A			Village B		
		Male (<i>n</i> = 107)	Female (<i>n</i> = 147)	Total (<i>n</i> = 254)	Male (<i>n</i> = 68)	Female (<i>n</i> = 72)	Total (<i>n</i> = 140)
Had premarital sex	Yes	20.6	9.5	14.2	20.6	11.1	15.7
	Missing data	0.0	0.0	0.0	0.0	1.4	0.7
Had extramarital sex (<i>n</i> = 382) ^a	Yes	26.5	17.0	20.8	15.4	9.7	12.4
	Missing data	0.0	0.7	0.4	0.0	1.4	0.7
Had sex with a FSW ^b	Yes	13.1	–	–	11.8	–	–
	Missing data	3.7	–	–	7.4	–	–
Had more than one sex partner	Yes	32.7	17.7	24.0	19.1	11.1	15.0
	Missing data	0.0	0.0	0.0	0.0	1.4	0.7
Diagnosed with STI in life time	Yes	4.7	2.0	3.1	5.9	0.0	2.9
	Missing data	2.8	0.7	1.6	8.8	5.6	7.1
Used a condom during the first sexual encounter	Yes	6.5	4.1	5.1	5.9	4.2	5.0
	Missing data	4.7	0.7	2.4	4.4	2.8	3.6
Used a condom during the last sexual encounter	Yes	8.4	4.8	6.3	8.8	2.8	5.7
	Missing data	3.7	5.4	4.7	13.2	8.3	10.7
Ever used a condom with spouse (<i>n</i> = 382) ^a	Yes	19.4	10.9	14.3	26.2	9.7	17.5
	Missing data	1.0	4.8	3.3	12.3	8.3	10.2
boy/girlfriends (<i>n</i> = 79) ^c	Yes	51.7	25.0	39.6	85.7	58.3	73.1
	Missing data	13.8	4.2	9.4	0.0	0.0	0.0
FSW ^c (<i>n</i> = 22) ^d	Yes	28.6	–	–	25.0	–	–
	Missing data	35.7	–	–	37.5	–	–

^a Married only (M = 163, F = 219)

^b FSW, female sex worker

^c Those having had sex with a boy/girlfriend (M = 43, F = 36)

^d Those having had sex with a FSW (M = 22)

sexual intercourse was 23.1 (*SD* = 4.7) and 19.4 (*SD* = 3.4) for males and females, respectively. Premarital and extramarital sex and multiple sexual partnerships were experienced by 20% to 30% of males and 10% to 16% of females. Sex with a FSW was experienced by 12.6% of males.

During their lifetimes, approximately 80% of the participants indicated that they had never used a condom with their spouse, and one-third of males indicated they had never used a condom with a FSW. The condom nonusage rate of females with a boyfriend was much higher than that of males with a girlfriend, $\chi^2(1, N = 74) = 7.6, P < .01$.

A history of STI was reported by 5.1% (*n* = 9) of sexually active male participants, and was significantly concentrated in males with a history of having sex with a FSW compared with those who had no such history, $\chi^2(1, N = 159) = 16.7, P < .01$.

Correlates of Sexual Behavior

Premarital and extramarital sex and sex with a FSW were evaluated with bivariate analyses in relation to possible risk factors (see Table 4). Analyses of premarital and extramarital sex were limited to the

married respondents and excluded sex with a FSW. Premarital sex was significantly associated with occupational experience in town; extramarital sex was associated with Village A, a nonfarmer status, and drug use. Sex with a FSW was associated with being unmarried, a nonfarmer status, education higher than primary school, graduating from a school in town, and occupational experience in town. Religion, HIV/STI-related knowledge, and attitudes toward nontraditional sexual practices did not demonstrate significant correlations.

Multivariate logistic analyses using a backward stepwise procedure were then performed both for all participants and by village among married respondents with no history of sex with a FSW for premarital and extramarital sex and only among males for sex with a FSW (see Table 5). In the multivariate analysis for all, occupational experience in town remained significantly associated with premarital sex and sex with a FSW. Respondents who had ever worked in town were 2.4 times more likely to have reported premarital sex and those males were 3.7 times more likely to have had sex with a FSW, whereas Christians were 2.4 times more likely to have reported premarital sex. Participants in Village A and drug users were 3.1 times and 2.8 times

Table 4 Bivariate analyses of correlates of premarital and extramarital sex and sex with a FSW among sexually active Karen survey participants in two villages^a

Explanatory variables		Premarital sex ^b			Extramarital sex ^b			Sex with FSW ^c (lifetime)		
		n	(%)	χ^2	n	(%)	χ^2	n	(%)	χ^2
Village	A (developed)	233	9.9	1.1	233	18.9**	7.5	103	13.6	0.0
	B (less developed)	125	13.6		125	8.0		63	12.7	
Age group (years)	15–34	198	13.6	2.7	198	15.7	0.1	82	18.3†	3.6
	35–54	160	8.1		160	14.4		84	8.3	
Sex	Male	141	13.5	1.2	141	15.6	0.0	–	–	–
	Female	217	9.7		217	14.7		–	–	
Marital status	Married or divorced	–	–	–	–	–	–	155	9.0**†	36.2
	Never married	–	–	–	–	–	–	11	72.7	
Religion	Christianity	156	14.7†	3.6	156	14.1	0.3	83	15.7	0.7
	Others ^d	193	8.3		193	16.1		80	11.3	
Education	Primary or lower	300	10.3	1.0	300	14.3	0.7	132	9.8 ⁱ	6.9
	Secondary or higher	53	15.1		53	18.9		33	27.3	
Main occupation	Farmer	324	10.2 ⁱ	3.3	324	13.6 ⁱ	6.9	140	8.6**†	23.6
	Nonfarmer ^e	28	21.4		28	32.1		21	47.6	
Graduated from a school in town	Graduated	31	19.4 ⁱ	2.5	31	19.4 ⁱ	0.6	28	28.6 ⁱ	7.0
	Not graduated	308	10.1		308	14.3		131	9.9	
Worked in town	Worked	61	23.0**	9.8	61	14.8	0.0	68	23.5*	10.4
	Never worked	290	9.0		290	15.2		97	6.2	
HIV/STI-related knowledge score ^f	Lower (0–8)	158	10.1	0.3	158	15.2	0.0	48	18.8	1.8
	Higher (9–17)	200	12.0		200	15.0		118	11.0	
Sexual attitude	Conservative ^g	339	10.6 ⁱ	0.8	339	15.3 ⁱ	1.1	151	13.2 ⁱ	0.0
	Not conservative	17	17.6		17	5.9		14	14.3	
Drug use ^h (last year)	Used	46	10.9	0.0	46	26.1*	4.8	47	19.1	1.6
	Did not	294	11.6		294	13.6		113	11.5	

† $P < 1$, * $P < .05$, ** $P < .01$ ^a Calculated excluding missing data. Degree of freedom of every comparison = 1^b Married with no history of sex with a FSW^c Males only^d Buddhism and animism^e Daily wage laborer, student, and other^f Knowledge score is the total score for 17 true-or-false questions regarding knowledge about the transmission, prevention, and treatment of HIV/STI^g Those who never agreed to premarital sex, extramarital sex, and sex with a FSW^h Amphetamines, heroin, opium, or marijuanaⁱ Fisher's exact test

more likely to have had extramarital sex, respectively. Unmarried male respondents and those with a nonfarmer status were almost 11 times and 5 times more likely to have had sex with a FSW, respectively. Village-wise analyses further revealed that in Village A, a nonfarmer status was significantly associated with all types of nontraditional sexual behaviors, while other factors were differently associated with nontraditional behaviors: the younger age group (15–34 years old) was almost four times more likely to have reported premarital sex, drug users in the last year were 2.6 times more likely to have had extramarital sex, and unmarried men were 16 times more likely to have had sex with a FSW. In Village B, however, only two

associations were significant: those who had occupational experience in town were 3 times more likely to have reported premarital sex and unmarried males were 20 times more likely to have had sex with a FSW.

Discussion

This study evaluated the prevalence and social correlates of nontraditional sexual behaviors among Karen villagers. The results revealed that traditional sexual attitudes prevailed strongly in both villages, with over 95% of the respondents indicating that sexual relationships before marriage and extramarital sex were

Table 5 Multivariate analyses of correlates of premarital and extramarital sex and sex with a FSW among sexually active Karen survey participants by village and of the whole population^a

Explanatory variables	Premarital sex ^b (lifetime)		Extramarital sex ^b (lifetime)		Sex with FSW ^c (lifetime)	
	AOR ^d	95% CI	AOR ^d	95% CI	AOR ^d	95% CI
Village A (Developed)						
Age group of 15–34 (vs. 35–54)	3.91*	1.08–14.17				
Never married (vs. married or divorced)	–	–	–	–	16.15**	1.96–133.15
Nonfarmer ^e (vs. farmer)	4.13*	1.35–12.65	2.61*	1.03–6.65	9.98**	2.00–49.95
Used drug ^f in the last year (vs. did not use)			2.61*	1.03–6.65		
Village B (Less developed)						
Never married (vs. married or divorced)					20.20*	1.36–301.09
Ever worked in town (vs. never)	3.13*	1.09–9.03				
Whole Study population						
Village A (vs. Village B)			3.17**	1.38–7.28		
Never married (vs. married or divorced)	–	–	–	–	10.79**	2.19–53.17
Christianity (vs. Buddhism or animism)	2.42*	1.10–5.31				
Nonfarmer ^e (vs. farmer)					4.89*	1.41–17.00
Worked in town (vs. never)	2.44*	1.09–5.48			3.66*	1.16–11.53
Used drug ^f in the last year (vs. did not use)			2.84*	1.28–6.32		

* $P < .05$, ** $P < .01$ ^a Calculated excluding missing data^b Married with no history of sex with a FSW^c Male only^d Adjusted odds ratio^e Daily wage laborer, student, and other^f Amphetamines, heroin, opium, or marijuana

unacceptable. However, nontraditional sexual behaviors, such as premarital and extramarital sex and sex with a FSW, were seen in 10% to 20% of the participants in both villages, suggesting that sexual traditions are waning.

The multivariate analysis of all the participants revealed that these nontraditional sexual practices were significantly associated with occupational experience in town, a nonfarmer status (e.g., student, daily wage laborer), and living in Village A, which has a paved road connecting it with a town. It appears that a mobile lifestyle, which allows more contact with town life, promotes changes in sexual traditions. The strong association of nonfarmer status with sex with a FSW could also be explained by a potential regular cash income among the daily wage laborers, since seven out of ten nonfarmers with a history of sex with a FSW were daily wage laborers. The association of premarital sex with Christianity was not unexpected, since a recent anthropology study revealed that Christianity brought about a deterioration in the sexual sanctions based on rituals on conversion of the ritual leaders to Christianity (Hayami, 2003).

The risk profiles associated with nontraditional sexual behaviors appear to differ between villages. Nonfarmer status was associated with all types of nontraditional sexual behavior in Village A, but not in Village B. This may be related to the fact that there are private construction and timber businesses in Village A, where there is electricity and a paved road to town. These job opportunities may have shifted the labor pattern of Village A to more daily wage laborers than in Village B; living on cash, having more free time, and the easy access to town might have contributed to the change in the opportunity for and the cultural norm to nontraditional sexual behaviors among daily wage laborers in Village A. Conversely, experience working in town was significantly correlated with premarital sex in Village B only, and not in Village A. This might be related to the fact that people in Village B have to leave the village for jobs because there are no private businesses in the village.

The villages are not without a risk of HIV infection, although the proportion of participants who had a history of sex with a FSW was smaller than that reported for Thais (Lertpiriyasuwat, Plipat, & Jenkins, 2003). This is suggested from the fact that male participants

with a sexual history with a FSW had many more partnerships in a lifetime than those with no history of sex with a FSW [86.4% (19/22) vs. 18.8% (27/144)]. In addition, condoms are only infrequently used during sex with a FSW and rarely used during sex with spouses within the study population. If this situation continues or expands, HIV could easily be introduced through such vulnerable sexual linkages. In light of this possibility, the observed association between sex with a FSW and a self-reported history of STI is alarming. In a departure from tradition, the use of amphetamines rather than opium was dominant among drug users. If this drug practice becomes more widespread, it might increase the risk of HIV infection among Karen villagers by increasing the prevalence of nontraditional sexual practices. Furthermore, the villages have an actual risk for HIV infiltration since they are located very close to the epicenter of HIV infection in Thailand.

This study has several limitations. Despite gender matching between interviewers and participants, confidential settings for interviews, and self-administered answer sheets for sensitive questions, we might have failed to eliminate reporting bias because of the sensitive nature of the questions. Our results cannot be generalized to other Karen populations, as only two villages were studied. Moreover, we failed to include 18.1% of the inhabitants because of their absence during the study period or missing data on age, sex, or sexual behaviors. It is possible that our data underestimated the sexual behaviors of villagers because those who were absent might have been more mobile and frequent travelers to town, and as a result might have been more sexually active.

Within these potential limitations, our study demonstrated the presence of a risk for sexually transmitted HIV infection among mountain-dwelling Karen villagers, which had not previously been well documented. Although the conservative nature of the Karen sexual culture might contribute to the extremely low HIV prevalence rate (Beyrer et al., 1997), despite living close to the infection epicenter in Thailand, our findings suggest that this trend will not persist. As HIV spread readily and widely among FSWs and male clients in the Thai population within a short time in the early 1990s, especially in northern Thailand, emerging unprotected sexual contact with a FSW, and other nontraditional sexual behaviors, will allow the HIV to infiltrate these mountain-dwelling ethnic minority communities if no timely, effective preventive measures are taken.

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References

- Beyrer, C., Celentano, D. D., Suprasert, S., Sittitrai, W., Nelson, K. E., & Kongsu, B., et al. (1997). Widely varying HIV prevalence and risk behaviors among the ethnic minority peoples of northern Thailand. *AIDS Care*, 9(4), 427–439.
- Celentano, D. D., Hodge, M. J., Razak, M. H., Beyrer, C., Kawichai, S., & Cegielski, J. P., et al. (1999). HIV-1 incidence among opiate users in northern Thailand. *American Journal of Epidemiology*, 149(6), 558–564.
- Celentano, D. D., Jittiwutikorn, J., Hodge, M. J., Beyrer, C., & Nelson, K. E. (1998). Epidemiology of HIV-1 infection in opiate users in northern Thailand. *Journal of Acquired Immune Deficiency Syndromes Human Retrovirology*, 17(1), 73–78.
- Celentano, D. D., Nelson, K. E., Suprasert, S., Eiumtrakul, S., Tulvatana, S., & Kuntolbutra, S., et al. (1996). Risk factors for HIV-1 seroconversion among young men in northern Thailand. *JAMA*, 275(2), 122–127.
- Department of Public Welfare. (1997). *Highland community in 20 provinces of Thailand, 1997*. Bangkok: Ministry of Labor and Welfare.
- Hayami, Y. (2003). Morality, sexuality and mobility: changing moral discourse and self. In O. D. Claudio (Eds.), *Living at the edge of Thai society: The karen in the highlands of northern Thailand* (pp. 112–129). London: Routledge/Curzon.
- Lertpiriyasuwat, C., Plipat, T., & Jenkins, R. A. (2003). A survey of sexual risk behavior for HIV infection in Nakhonsawan, Thailand, 2001. *AIDS*, 17(13), 1969–1976.
- Lewis, P., & Lewis, E. (1998). *Peoples of the golden triangle*. London: Thames and Hudson.
- Limpakarnjanarat, K., Mastro, T. D., Saisorn, S., Uthavoravit, W., Kaewkungwal, J., & Korattana, S., et al. (1999). HIV-1 and other sexually transmitted infections in a cohort of female sex workers in Chiang Rai, Thailand. *Sexually Transmitted Infection*, 75(1), 30–35.
- Nopkesorn, T., Mastro, T. D., Sangkharomya, S., Sweat, M., Singharaj, P., & Limpakarnjanarat, K., et al. (1993). HIV-1 infection in young men in northern Thailand. *AIDS*, 7(9), 1233–1239.
- Omori, K. (1999). Knowledge about AIDS and risk behaviors among hill tribes in northern Thailand. *Nippon Koshu Eisei Zasshi*, 46(6), 466–475.
- Razak, M. H., Jittiwutikorn, J., Suriyanon, V., Vongchak, T., Srirak, N., & Beyrer, C., et al. (2003). HIV prevalence and risks among injection and noninjection drug users in northern Thailand: need for comprehensive HIV prevention programs. *Journal of Acquired Immune Deficiency Syndromes*, 33(2), 259–266.
- Torugsa, K., Anderson, S., Thongsen, N., Srisopana, N., Jugsudee, A., & Junlananto, P., et al. (2003). HIV epidemic among young Thai men, 1991–2000. *Emerging Infectious Diseases*, 9(7), 881–883.
- UNAIDS. (2004). *2004 Report on the HIV/AIDS Epidemic: 4th Global Report*. Bangkok: UNAIDS.
- Wiewel, E. W., Go, V. F., Kawichai, S., Beyrer, C., Vongchak, T., & Srirak, N., et al. (2005). Injection prevalence and risks among male ethnic minority drug users in northern Thailand. *AIDS Care*, 17(1), 102–110.

Sexual behavior and awareness of Chinese university students in transition with implied risk of sexually transmitted diseases and HIV infection: A cross-sectional study

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Abstract

Background: The vulnerability of young people to HIV and the recent emergence of the HIV epidemic in China have made it urgent to assess and update the HIV/STD risk profile of Chinese young people.

Methods: A self-administered questionnaire survey with cross-sectional design was conducted among 22,493 undergraduate students in two universities in Ningbo, China. Bivariate trend analysis and multiple logistic regression analysis were used to compare sexual behaviors and awareness between grades.

Results: Of respondents, 17.6% of males and 8.6% of females reported being sexually active. Condom was reported never/rarely used by 35% of sexually active students in both genders in the previous year. Pregnancy and induced abortion had each been experienced by about 10% of sexually active female students and the female partners of male students, and about 1.5% of sexually active students of both genders reported being diagnosed with an STD. Multivariate analysis revealed that students in lower grades, compared to those in higher grades, were more likely to have become sexually active before university, to have become aware of sex before high school, and to have been exposed to pornographic media before the age of 17 years, and for sexually active respondents of both genders, to have engaged in sex without using a condom.

Conclusion: Sexual behaviors of Chinese university students are poorly protected and sexual behaviors and awareness may have been undergoing rapid change, becoming active earlier and more risky. If this trend continues, vulnerable sexual network will grow among them that allow more expansion of sexually transmitted diseases and HIV.