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SUPPLEMENT

HIV prevalence and related risk behaviours among prisoners in Iran: results of the national biobehavioural survey, 2009

Soodabeh Navadeh,¹ Ali Mirzazadeh,^{1,2} Mohammad Mehdi Gouya,³ Marziyeh Farnia,⁴ Ramin Alasvand,⁴ Ali-Akbar Haghdooost^{1,5}

¹Regional Knowledge Hub, and WHO Collaborating Centre for HIV Surveillance, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

²Institute for Health Policy Studies, University of California, San Francisco, California, USA

³Ministry of Health & Medical Education, Center for Disease Control, Tehran, Iran

⁴Iran Prisons Organization, Tehran, Iran

⁵Research Center for Modeling in Health, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

Correspondence to

Dr Ali-Akbar Haghdooost, Research Center for Modeling in Health, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Avicenna Avenue, Jihad Boulevard, Kerman, Kerman 7619813159, Iran; ahaghdooost@hivhub.ir

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ABSTRACT

Objectives To estimate the prevalence of HIV and related risk behaviours among prisoners in Iran in 2009.

Methods Using multistage random sampling, we recruited 5,530 prisoners from 27 prisons in Iran. Behavioural data were collected using a face-to-face questionnaire-based interview, and HIV status was determined by ELISA of dried blood spots. Weighted estimates were calculated based on the sampling probability and response rate.

Results HIV prevalence was 2.1% (95% CI 1.2 to 3.6). One in eight prisoners (12.3%, 95% CI 8.0% to 16.6%) had been tested for HIV in the last year and received results, 20.5% (95% CI 15.1 to 27.4%) had comprehensive knowledge about HIV and 24.7% (95% CI 17.9% to 32.9%) reported condom use at last vaginal/anal sex in prison. Although 16.5% (95% CI 12.5% to 21.5%) acknowledged a lifetime history of drug injection, only 22 prisoners reported drug injection inside the prison in the month preceding the interview. Of note, 12.9% (95% CI 10.6% to 15.6%) had been tattooed in prison. There were significant associations between HIV prevalence and a history of drug injection (adjusted odds ratio (AOR): 7.8, 95% CI 4.7 to 13.2), tattooing (AOR: 2.1, 95% CI 1.1 to 4.2) and age over 30 years (AOR: 1.4, 95% CI 1.1 to 1.9).

Conclusions Considerable HIV prevalence among prisoners is found in Iran. Expanding harm reduction programmes inside prisons with inclusion of sexual risk reduction programmes and post-release programmes will help directly prevent acquisition and transmission of infection inside prisons and indirectly slow onward transmission in the outside communities.

from 100 prisoners in 2002 to more than 25 400 in 2009.³

The impact of expanding harm reduction services inside prisons has not yet been systematically evaluated. Modelling suggests the interventions inside prisons may have reduced the national HIV transmission rate.⁵ Periodic reports from sentinel surveillance sites have also reported a decrease in the number of HIV-positive cases identified since 2002.^{6–8} However, the lack of direct information on the prevalence of HIV and related risk behaviours leave doubt as to whether the ongoing harm reduction services are sufficient to prevent further transmission of HIV inside prisons.

Based on the above-mentioned need, this study was designed to provide credible estimates of the prevalence of HIV and related risk behaviours among prisoners in Iran. We believe this population is underserved by HIV prevention services, as are the prison populations of many countries in the Middle East and Eastern Mediterranean regions. We report here on the results of this study—the first of its kind for the region.

METHODS

From May to July 2009, we recruited 5530 prisoners from 27 prisons using a multistage random sampling design. First, we grouped prisons into 2 strata based on the median number of prisoners, resulting in 119 small and 119 large prisons. We then randomly selected 13 and 14 prisons from the small and large prison strata, respectively. To achieve a sample proportionate in size to the number of eligible prisoners in the 2 strata, we recruited 786 prisoners from the small and 4744 prisoners from the large prisons. The sample size for each selected prison was proportionate in size to the relative number of prisoners in its strata. We then employed systematic random sampling from the roster of all inmates in the prison in order to recruit eligible prisoners into the survey. Eligible prisoners were those who spent at least 1 week in the prison, had not participated in similar studies in the 2 months preceding the interview and provided verbal informed consent to participate in the study.

At each prison, a trained, gender-matched interviewer from the prison health staff consecutively approached the selected prisoners to verify eligibility. The interviewer introduced the study, and those providing informed consent were enrolled. The demographic characteristics were collected even if

BACKGROUND

Around the world, prisoners are at risk for HIV and hepatitis C and B infections, particularly those with a history of injecting drug use.^{1–2} In the mid 1990s, significant HIV outbreaks were reported in several prisons in Iran. Investigations into the outbreaks indicated unsafe drug injection during incarceration as the main mode of HIV transmission among prisoners.³

These HIV outbreaks triggered Iranian health and justice authorities to initiate and scale-up harm reduction services (including needle/syringe exchange and methadone maintenance therapy) inside prisons.⁴ As a result, the total number of prisoners covered by methadone therapy increased

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the person was not eligible, or declined to be in the survey. No incentive, either material or in privileges, was given as compensation to participants. Interviews and pre-test counselling were performed in a private room on site. All interviewers used a structured questionnaire, gathering information on sociodemographic characteristics and main HIV-related variables (substance use, sexual risk behaviours, partners and condom use, history and treatment of sexually transmitted diseases, tattooing, knowledge and attitudes towards HIV/AIDS and HIV testing history) consistent with international instruments used for similar biobehavioural surveys.^{9 10} We considered the person to have comprehensive knowledge/attitude about HIV/AIDS if he or she correctly recognised three ways of preventing HIV transmission and rejected two misconceptions about it.

Following the interview, those who consented were tested by the interviewer or trained laboratory staff. For each person, five dried blood spots were collected and tested for anti-HIV1 and anti-HIV2 antibodies, and HIV antigens using ELISA (Vironostika HIV Uni-Form II Ag/Ab, bioMérieux, France). The participant was considered as HIV positive if the positive result of the first ELISA test was repeated by a second test of the same manufacturer. All negative and positive results were returned to the prison health clinic tagged only with a unique code. Prisoner participants were able to get their test result by providing the code and receiving post-test counselling at the prison clinic.

Data were entered into an Epi-Data datafile, with a 10% re-entry for quality control, and analysed by the STATA/SE 12.0 survey package (StataCorp LP; College Station, Texas, USA). We report weighted prevalence estimates based on the inverse sampling probability and response rate probability. To explore factors associated with HIV, we applied multiple logistic regression, including all variables presented in table 1 with $p < 0.2$ as candidate predictor variables.

The study protocol and procedures were reviewed and approved by the Research Review Board of the Kerman University of Medical Sciences, the Ministry of Health and the Iran Prisons Organization, the latter being a prisoner advocacy group.

RESULTS

Of the 5530 prisoners who were assessed for eligibility, 5375 (97.1%) were eligible and agreed to participate in the survey. After completing the interview, 367 (6.8%) prisoners declined to provide a blood specimen for HIV testing. Blood samples from 4536 prisoners were suitable specimens and were tested for HIV. We assessed any differences in the demographic characteristics of prisoners who were eligible, declined to participate in the survey, declined to be tested for HIV and those with an unsuitable blood sample. No significant differences by these groups suggested little selection bias, and indicated that missing data were random. The vast majority of persons enrolled were men; over half were 30 years or older.

Table 1 presents HIV prevalence by prisoner characteristics. The table provides the weighted prevalence of each group. We detected 88 HIV-positive cases. All positives were infected with HIV-1 (no HIV-2 was detected). The overall weighted prevalence of HIV infection was 2.1% (95% CI 1.2% to 3.6%). Prevalence was 8.1% (95% CI 4.6% to 13.8%) among those who had injected drugs at least once during their life and 0.9% (95% CI 0.5% to 1.6%) in those who had never done so. HIV prevalence was not different between men and women (2.1% vs 1.9%) ($p=0.9$), although few women were enrolled. HIV

Table 1 Prevalence of HIV infection in different groups of prisoners in a biobehavioural survey, Iran, 2009

Variables (n)	HIV-positive cases <i>n</i> (%) [*] (95% CI)	<i>p</i> Value [†]
Total sample with qualified blood spot (4536)	88 (2.1) (1.2 to 3.6)	
Sex		
Male (4337)	84 (2.1) (1.2 to 3.6)	0.91
Female (199)	4 (1.9) (0.6 to 5.9)	
Age [‡]		
<30 years old (2022)	33 (1.8) (1.1 to 3.1)	0.07
≥30 years old (2510)	55 (2.3) (1.1 to 4.2)	
Months spent in prison in past 10 years [‡]		
<3 (689)	8 (1.2) (0.5 to 2.6)	0.07
3–11 (1506)	17 (1.6) (0.6 to 3.9)	
12–36 (1308)	28 (2.1) (1.1 to 3.8)	
>36 (1033)	35 (3.2) (1.7 to 5.9)	
Ever injected drugs [‡]		
Yes (726)	54 (8.1) (4.6 to 13.8)	<0.0001
No (3803)	34 (0.9) (0.5 to 1.6)	
Used heroin in the past month in prison [‡]		
Yes (215)	11 (5.7) (2.2 to 14.3)	0.002
No (4211)	64 (1.6) (0.9 to 3.1)	
Used heroin in the past month before incarceration [‡]		
Yes (594)	41 (7.8) (4.4 to 13.6)	<0.0001
No (4215)	43 (1.2) (0.7 to 1.9)	
Ever had a tattoo [‡]		
Yes (2041)	65 (3.3) (2.1 to 5.4)	0.0002
No (2492)	23 (1.0) (0.5 to 2.2)	
Ever had sex		
Yes (3912)	73 (2.0) (1.2 to 3.4)	0.60
No (621)	15 (2.5) (0.9 to 6.4)	
Had extramarital intercourse in the last year before incarceration		
Yes (1354)	28 (2.2) (1.5 to 3.4)	0.69
No (3089)	59 (2.0) (1.1 to 3.9)	
Number of heterosexual partners in the past year		
None (3089)	60 (2.3) (1.1 to 3.9)	0.65
1 (503)	10 (2.1) (1.1 to 4.0)	
2–3 (338)	6 (1.9) (1.1 to 3.6)	
>3 (480)	12 (2.7) (1.7 to 4.2)	
Used condom in last extramarital intercourse		
Yes (1106)	26 (2.5) (1.5 to 4.1)	0.60
No (1450)	32 (2.3) (1.5 to 3.6)	
Men who have ever had anal sex with men		
Yes (62)	2 (3.7) (0.6 to 18.8)	0.56
No (2398)	47 (2.0) (0.9 to 4.4)	
Ever treated for a sexually transmitted infection		
Yes (223)	4 (1.9) (0.5 to 6.8)	0.88
No (4167)	80 (2.0) (1.2 to 3.5)	

^{*}Percentage in each row presents weighted prevalence of HIV infection in that subgroup, which due to adjustments is not exactly the same as applying.

[†]Derived from χ^2 tests of association.

[‡]Variables with a *p* value less than 0.2 in bivariate analysis were included in the multiple regression model.

prevalence varied from 0% to 6.4% in different prisons; however, such differences were not statistically significant ($p=0.8$).

In the multiple regression model, we observed statistically significant associations between HIV prevalence and history of drug injection (adjusted OR (AOR): 7.8, 95% CI 4.7 to 13.2), tattooing (AOR: 2.1, 95% CI 1.1 to 4.2) and age over 30 years (AOR: 1.4, 95% CI 1.1 to 1.9).

More than one in eight prisoners (12.3%, 95% CI 8.9% to 16.6%) had been tested for HIV in the last year and received results; 20.5% (95% CI 15.1% to 27.4%) had a comprehensive knowledge about HIV, 24.7% (95% CI 17.9% to 32.9%) reported condom use at the last vaginal/anal sex in prison and 4.7% (95% CI 3.1% to 7.1%) of prisoners reported that they had a sexually transmitted disease symptom in last year while they were in prison. Although 16.5% (95% CI 12.5% to 21.5%) acknowledged lifetime history of drug injection, only 22 prisoners reported drug injection inside prison in the 1 month preceding the interview (of those 55% injected with a shared needle). In addition, 12.9% (95% CI 10.6% to 15.6%) had been tattooed while in prison.

DISCUSSION

In this study, the prevalence of HIV infection among prisoners was about 2% and disproportionately affected those who ever injected drugs, had been tattooed and were over 30 years old. Only one in eight had been tested and knew their HIV status, one in four had used a condom during their last instance of sexual intercourse and only one in five had sufficient knowledge of the routes of HIV transmission and preventive measures.

Overall, relatively few prisoners reported recent injecting while in prison, making assessment of the reach of harm reduction services uncertain. While harm reduction services with a focus on needle/syringe exchange programmes and methadone maintenance therapy are active inside the prisons, the cross-sectional nature of the study also makes inference on their impact difficult.

While our data indicate that the prevalence of HIV infection among prisoners has decreased considerably since the outbreaks inside prisons in the 1990s,⁵ it is still much higher than in the general population of adults in Iran. Of course, many prisoners may have acquired their infection before incarceration. However, without highly effective interventions on site, the environment inside prisons might increase the risk of transmission substantially through sex and injection-related behaviours. Moreover, transmission to the larger society may subsequently occur upon release.

Harm reduction services have to be specifically tailored for the special environment within prisons and include more components regarding preventive knowledge and safer sexual practices. These complementary items may also help to improve HIV testing uptake and reduce overall stigma around HIV and related risk behaviours.

We observed that the history of drug injection increased the risk of HIV infection around eightfold; such a high relative risk has not been found in other studies from around the world, such as in Australia.¹¹ This might be due to the specific pattern of HIV transmission in Iran, which is mainly via unsafe injection. The recent national model suggests that around 56% of the new infected cases occurring in Iran in 2010 were through unsafe drug injection.¹²

The turnover of prisoners back to society is high in Iran. Furthermore, prisoners are not separated from each other based on history of drug use. Therefore, they might transmit the HIV virus from outside prison, amplify infection while inside prison,

and further transmit infection to other persons in their sexual or drug-related networks when released. Therefore, inside prison harm reduction services may be particularly beneficial on the epidemic as a whole and also need to be continued as part of post-incarceration services to all prisoners with either drug or sexual risk.

We acknowledge limitations of our study. The first issue is the social desirability response bias that may lead to under-reporting of stigmatised behaviours,¹³ especially in a prison setting and when data are collected by prison health staff. We did not assess the impact of this bias; however, we believe by using specifically trained interviewers, comprehensive rapport building at the recruitment phase and also ensuring participants that the responses would be treated as confidential, we helped to minimise the impact. We are also unable to assess the participation bias in HIV testing as we did not collect reasons for refusal or self-reported HIV status.

In conclusion, the observed considerable HIV prevalence among prisoners reflects transmission before and during incarceration among this population. The current harm reduction services with the focus on drug-related risky behaviours need to be continued and expanded in terms of incorporating sexual-related risk behaviour interventions and post-incarceration services to maximise their beneficial effects on prisoners and the communities from which they come.

Key messages

- ▶ The HIV prevalence among prisoners in Iran is much higher than in the general population.
- ▶ Although prisoners might acquire HIV infection before incarceration, continuing harm reduction programmes with focus on those ever injecting drugs, being tattooed and in older age groups will help inhibit further transmission of infection inside the prisons. Such services need to include sexual-related harm reduction and also expand to post-incarceration services.

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REFERENCES

- 1 Dolan K, Kite B, Black E, *et al.* HIV in prison in low-income and middle-income countries. *Lancet Infect Dis* 2007;7:32–41.

- 2 Shahbazi M, Farnia M, Moradi G, *et al*. The trend of HIV/AIDS prevalence among IDU's in Iranian prisoners (1376–1386) [abstract]. *Retrovirology* 2010;7(Suppl 1): P101.
- 3 Farnia M, Ebrahimi B, Shams A, *et al*. Scaling up methadone maintenance treatment for opioid-dependent prisoners in Iran. *Int J Drug Policy* 2010;21:422–4.
- 4 Zamani S, Farnia M, Torknejad A, *et al*. Patterns of drug use and HIV-related risk behaviors among incarcerated people in a prison in Iran. *J Urban Health* 2010;87:603–16.
- 5 Haghdoost A, Mostafavi E, Mirzazadeh A, *et al*. Modelling of HIV/AIDS in Iran up to 2014. *J AIDS HIV Res* 2011;3:231–9.
- 6 Azarkar Z, Sharifzadeh G, Miraki M. HBV, HCV and HIV prevalence among south Khorasan prisoners. *J Birjand Univ Med Sci* 2007;2:50–5. (Abstract in English, full text in Persian).
- 7 Javadi A, Ataei B, Pourahmad M. The relationship between frequency and duration of imprisonment and the prevalence of HBS Ag, AntiHCV and HIV antibody seropositivity in Iranian prisoners. *J Med Council IRI* 2007;24:358–64.
- 8 Rahimi-Movaghar A, Amin-Esmaeili M, Haghdoost A, *et al*. HIV prevalence amongst injecting drug users in Iran: a systematic review of studies conducted during the decade 1998–2007. *Int J Drug Policy* 2012;23:271–8.
- 9 Amon J, Brown T, Hogle J, *et al*. Behavioral surveillance surveys BSS; guidelines for repeated behavioral surveys in populations at risk of HIV. Washington DC: Family Health International, 2009.
- 10 UNAIDS Monitoring the Declaration of Commitment on HIV/AIDS. *Guidelines on construction of core indicators: 2010 reporting, United Nations General Assembly Special Session on HIV/AIDS*. Geneva, Switzerland: UNAIDS, 2009.
- 11 Butler T, Boonwaat L, Hailstone S, *et al*. The 2004 Australian prison entrants' blood-borne virus and risk behaviour survey. *Aust N Z Public Health* 2007;31:44–50.
- 12 Nasirian M, Doroudi F, Gooya MM, *et al*. Modeling of human immunodeficiency virus modes of transmission in Iran. *J Res Health Sci* 2012;12:81–7.
- 13 Mirzazadeh A, Haghdoost AA, Nedjat S, *et al*. Accuracy of HIV-related risk behaviors reported by female sex workers, Iran: a method to quantify measurement bias in marginalized populations. *AIDS Behav* 2013;17:623–31.



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