

## Original Article

# Prevalence and Associated Factors of HIV Infection among Male Prisoners in Tehran, Iran

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## Abstract

**Background:** This is a cross-sectional survey conducted on 6900 male prisoners in Great Tehran Prison from October 2013 to May 2014.

**Methods:** In order to find HIV positive prisoners in the prison's quarantine and two housing units, we used HIV active case finding (ACF) strategy by rapid screening test. In ACF, healthcare staff and trained prisoners asked inmates to answer relevant questions about history of risky behaviors related to HIV as well as to be tested voluntarily by HIV rapid test. A positive result was confirmed by ELISA screening and Western blot tests. Furthermore, to find the prevalence of specific HIV risk factors among prisoners were assessed using a questionnaire, and the results were analyzed by STATA software, providing univariate and multivariate modeling.

**Results:** There were 85 HIV positive patients. The prevalence of HIV was 1.23%. The risk factors independently associated with HIV infection were age (adjusted odds ratio of 3.46 for 35–44 yrs., 95% CI: 1.01–11.92), duration of imprisonment (adjusted odds ratio of 4.22 for  $\geq 10$  yr., 95% CI: 1.92–9.24), history of injection drug use (adjusted odds ratio of 5.01, 95% CI: 2.24–11.18), history of needle sharing (adjusted odds ratio of 2.28, 95% CI: 1.25–4.16) and tattooing (adjusted odds ratio of 1.84, 95% CI: 1.05–3.24).

**Conclusions:** The prevalence and risk factors of HIV infection should be recognized by policy makers for intensifying harm reduction programs and reforming the HIV guidelines in prisons.

**Keywords:** HIV, Prevalence, Prison, Risk factors

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## Introduction

HIV is one of the most important infectious diseases in developing countries, imposing high financial demands on health care systems. The HIV prevalence is higher in prisons of many countries than the general population.<sup>1</sup> The general population is at risk of HIV, due to links between prison staff members, visitors, discharged prisoners, and the community. So, paying particular attention to this issue and planning to reduce HIV transmission in prisons can be useful to control its prevalence in the society.<sup>2</sup>

HIV infection is significantly more complicated in prisons than the society. There is a wide range of different factors associated with HIV prevalence among prisoners in different countries, based on HIV prevalence in society, samplings methods, and current policies on substance abuse. Hence, the rate is higher in some countries, while relatively lower in others. For instance, the prevalence of HIV

infection is reported 41.4% in South Africa,<sup>2</sup> 4–10% in Argentina,<sup>3</sup> 3–20% in Brazil,<sup>2</sup> 1.4% in the USA,<sup>4</sup> 2% in Canada,<sup>5</sup> 2% in France,<sup>6</sup> 6.5% in Russia,<sup>3</sup> 13% in Romania,<sup>7</sup> 8.8–23.9% in Estonia,<sup>7</sup> 0–34% in Slovakia,<sup>7</sup> 4% in five European countries (Germany, Italy, Netherlands, Scotland, and Sweden),<sup>8</sup> and 2.1% in Iran.<sup>9</sup>

Although there are evidences that drug injection in the prisons of Iran reduced considerably. According to some studies conducted in Iranian prisons, ever drug injection is common among prisoners and, it must be considered as the most frequent mode of HIV transmission in Iran when planning to control the HIV prevalence.<sup>10,11</sup> The rates of HIV prevalence vary among different countries and prisons, because different risk factors are associated with this infection. History of imprisonment, drug use, injecting drug use, tattooing, homosexuality, shared drug injection equipment, and low perception of risks are some risk factors related to HIV infection.<sup>12–14</sup>

Some policies are adopted for preventive intervention and controlling HIV infection in prisons such as screening newly admitted prisoners, distribution of condoms for safe sexual activities,<sup>15</sup> and communicating with agencies that provide medical care and health education.<sup>16</sup>

There are few studies about the prevalence of HIV and related risk factors in Iranian prisons. Therefore, we conducted a study to determine the exact prevalence of HIV infection to improve preventive programs and HIV control practices in prisons. In this line, the study sought to evaluate the prevalence and associated factors of HIV infection among male prisoners in Tehran, Iran during the period 2013–2014.

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## Materials and Methods

### Study Participants

The present study is a cross-sectional survey on 6900 male prisoners, conducted in the Great Tehran Prison from October 2013 to May 2014. The subjects were males arrested by the police. A questionnaire was used to record demographic data, imprisonment history, injecting drug use behaviors, and history of HIV sexual risk behaviors.

### Ethical considerations

Oral informed consents were provided for the enrolled people to attend in this study. Before HIV testing, the prisoners who had high-risk behaviors or had volunteered to do testing received group counseling. Post test counseling was done for inmates who were tested for HIV and they were also informed of the test results. If the result was negative, they were given required information regarding HIV prevention. Individual counseling was done for the prisoners who had positive results. Records were confined separately from the jail criminal record. Also, the study was approved by the Institutional Review Board (IRB) of Tehran University of Medical Sciences (TUMS).

### Process of case findings

The Great Tehran Prison contains three separate units. All prisoners are first taken to the "reception and identification unit (quarantine)" and then sent to the housing units one and two depending on their legal status. An HIV active case finding (ACF) strategy was employed in the quarantine and the two units through a voluntary provider-initiated HIV testing. Three staff members of the voluntary counseling and testing (VCT) center trained the prisoners about common routes of HIV transmission in the units. In the quarantine, all inmates were examined for HIV-risk factors and offered HIV testing. In Unit One, healthcare staff members implemented the ACF process while in Unit Two, trained prisoners were assigned as healthcare communicators to continue the process. If the result was positive, the process of care, treatment and follow up was initiated in the prison.

### Measurements

Blood specimens were collected for HIV rapid test by Trinity Biotech Uni-Gold™ Recombigen® HIV (sensitivity of 100% and specificity of 99.8%).<sup>17</sup> Positive rapid test results were confirmed by HIV ELISA screening (Pishtaz Teb, Iran) and Western blot (MP biomedical diagnostics, Germany).

### Statistical Analysis

Data were entered into a database using SPSS (version 18, Inc, Chicago), and analyzed by STATA (version 14, College Station, TX, USA). Logistic regression test was measured to report the results. The point prevalence of HIV was calculated as the number of confirmed HIV-positive individuals divided by the total number of test results, and stratified by demographic characteristics, incarceration history, drug use and sexual risk behaviors. Following a description on variable proportions and intervals (CI) at 95%, we conducted logistic regression analyses to determine the associated factors with HIV infection. In bivariate analysis, the variables associated with HIV infection at the  $P \leq 0.10$  level were included as potential independent predictors. The final model incorporated the variables associated with the infection at the  $P \leq 0.05$  level.

## Results

A total of 6900 prisoners were evaluated in the units using the ACF. In total, 2680 individuals had HIV-related behaviors with a mean age of 30.7 years ( $SD \pm 7.9$ ). Also, the minimum and maximum ages were 16 and 73 years, respectively.

In this study, out of 2860 inmates, 20 individuals (0.7%) declined to undergo HIV testing, so an HIV rapid test was performed for 2840 prisoners among whom 56 (1.97%) had a positive test; the results were supported by confirmatory tests. Also, 29 individuals admitted to the prison during the research period reported a history of HIV infection which was confirmed by inquiry. So, the total number of detected HIV positive patients was 85, consisting of 56 new and 29 old cases. As a result, 85 patients from 6900 people in the prison yield an HIV prevalence of 1.23%.

The prevalence of HIV-related factors among 2860 prisoners is shown in Table 1. In multivariate analysis with all variables associated with HIV infection at  $P \leq 0.05$  in bivariate analysis, age (adjusted odds ratio of 3.46 for 35–44 yrs., 95% CI: 1.01–11.92), duration of imprisonment (adjusted odds ratio of 4.22 for  $\geq 10$  yr., 95% CI: 1.92–9.24), history of injecting drug use (adjusted odds ratio of 5.01, 95% CI: 2.24–11.18), history of needle sharing (adjusted odds ratio of 2.28, 95% CI: 1.25–4.16), and tattooing (adjusted odds ratio of 1.84, 95% CI: 1.05–3.24) remained as factors independently associated with HIV infection ( $P \leq 0.05$ ) (Table1).

## Discussion

In our study, the participation rate for HIV testing was 99.3%. A research in Quebec suggested this rate as 95% among male prisoners.<sup>18</sup> Here, the rate of HIV prevalence in prison was higher than the society. However, similar findings are also reported from other countries.<sup>1,19,20</sup> In 2008, a study on all prisoners of Mazandaran, Iran, found seven individuals (0.3%) with HIV infection among 2405 prisoners.<sup>21</sup> In a systematic review, the HIV prevalence rate in prisons was more than 10% in 20 countries, and more than 10% among injecting drug users in eight countries.<sup>20</sup> In a bio-behavioral surveillance study among Iranian prisoners from 2012–2013, the prevalence rate of HIV was 1.4% (CI 95%: 0.6%–2.2%), and there is no statistical significance between this study and the same study performed previously in 2009 (2.1%, CI 95%: 1.2%–3.6%).<sup>9,11</sup> The findings of these two studies are in agreement with our study on the HIV prevalence among prisoners with a history of injecting drug use. Another study was conducted in Iran on 459 male IDUs arrested by the police. In this group, the prevalence rate was approximately 24.4%.<sup>12</sup> In three studies conducted in Iran to evaluate the HIV prevalence among drug users, the results were 5.8% among 121 prisoners in Gorgan,<sup>22</sup> 6.4% among 970 prisoners in Isfahan<sup>23</sup> and 15.1% among 252 prisoners in Bandar Abbas and Roodan.<sup>24</sup>

In our study, most of the HIV positive patients were aged 25 to 34 years. Similar results have been reported in other studies.<sup>25-27</sup> Also in this study, the duration of imprisonment more than 10 years was associated with higher risk of HIV infection. This was also reported in related studies from Nigeria, Australia, Brazil, England and Wales.<sup>28-31</sup>

As reported by some studies in Australia<sup>32</sup> and America,<sup>33</sup> HIV can rapidly and intensively spread in jails and involve the population of prisons.<sup>34</sup> Many factors may contribute to this.

**Table 1.** Characteristics, behaviors, and HIV seroprevalence among male prisoners, Tehran, Iran, 2013 – 2014.

Variable	N(%)	HIV <sup>+</sup> (N)	HIV Seroprevalence % (95% CI)
<b>Age (year)<sup>1</sup></b>			
16–24	625(21.9)	3	0.5(0.1–1.4)
25–34	1511(53.0)	41	2.7(2.0–3.7)
35–44	558(19.6)	34	6.1(4.3–8.4)
≥45	159(5.6)	6	3.8(1.4–8.0)
<b>History of addiction<sup>2</sup></b>			
History of injection drug use <sup>1</sup>	851(29.8)	71	8.3(6.6–10.4)
History of sharing needles or equipment <sup>1</sup>	445(15.6)	51	11.5(8.7–14.8)
Unprotected heterosexual relationship	2139(74.8)	57	2.7(2.0–3.4)
Extramarital relationship <sup>2</sup>	2196(76.8)	56	2.6(2.0–3.4)
Sex with multiple partners (two or more, except wife) <sup>3</sup>	1644(58.1)	38	2.3(1.6–3.2)
History of male-male sex	280(9.8)	10	3.6(1.7–6.5)
History of STI <sup>4</sup>	254(9.3)	13	5.1(2.8–8.6)
Condom use	1863(83.1)	6	2.7(2.0–3.6)
Transfusion of blood or blood products	207(7.2)	12	5.8(3.0–9.9)
Sexual partner of HIV positive patient	6(0.2)	1	16.7(0.4–64.1)
Tattooing <sup>1</sup>	1459(51.0)	61	4.2(3.2–5.3)
Phlebotomy	540(18.9)	18	3.3(1.2–5.2)
Machete ( <i>ghameh</i> )	173(6.1)	3	1.7(0.4–5.0)
Husband to a spouse with risk factors <sup>3</sup>	22(0.8)	3	13.6(2.9–34.9)
Tend to HIV testing <sup>1</sup>	281(9.8)	0	0(0–1.3)**
Occupational exposure	1(0.0)	0	0(0–97.5)**
Common buckthorn	2(0.1)	0	0(0–84.2)**
<b>Number of imprisonment (times)<sup>1</sup></b>			
1–3	1645(64.5)	32	1.9 (1.3–2.7)
≥4	906(35.5)	45	5.0 (3.6–6.6)
<b>Duration of imprisonment (years)<sup>1</sup></b>			
≤1	791(37.8)	13	1.6(0.9–2.8)
1–2	304(14.5)	6	2.0(0.7–4.2)
2–5	516(24.7)	21	4.1(2.5–6.1)
5–10	328(15.7)	14	4.3(2.4–7.1)
>10	151(7.2)	20	13.2(8.3–19.7)
<b>Drugs reported used at the present (local name)</b>			
Methamphetamine (Crystal)	164(5.7)	2	1.2(0.1–4.3)
Heroin	173(6.1)	5	2.9(0.9–6.6)
Opium ( <i>taryak</i> )	32(1.1)	0	0(0–10.9)**
Tramadol	3(0.1)	0	0(0–70.8)**
“Crack” (purer form of heroin)	15(0.5)	0	0(0–21.8)**
Cannabis (Hashish)	7(0.2)	0	0(0–41.0)**
<b>Drugs reported used at the past (local name)</b>			
Methamphetamine (Crystal) <sup>2</sup>	1161(40.6)	24	2.1(1.3–3.1)
Heroin	829(29.0)	31	3.7(2.6–5.3)
Opium ( <i>taryak</i> )	235(8.2)	8	3.4(1.5–6.6)
Tramadol	18(0.6)	0	0(0–18.5)**
Morphine	7(0.2)	0	0(0–41.0)**
“Crack” (purer form of heroin)	117(4.1)	7	6.0(2.4–11.9)
Cannabis (Hashish)	64(2.2)	2	3.1(0.4–10.8)
Cocaine	12(0.4)	1	8.3(0.2–38.5)

<sup>1</sup>  $P \leq 0.0001$ , <sup>2</sup>  $P = 0.02$ , <sup>3</sup>  $P = 0.03$ , <sup>4</sup>  $P = 0.04$ , \*Sexually Transmitted Infections, \*\* One-sided 97.5% CI

Despite all prediction practices and preventive programs adopted by prison staff members to restrict using drugs in prisons, drugs can be found in many prisons around the world.<sup>35,36</sup> A study performed in 1995 in Canada reported that 40% of prisoners used drugs. Also, in a research conducted in England during 1997 to 1999, 69% of prisoners used drug at least one time.<sup>37</sup> Many prisoners are using drugs when admitted to the prison, and some start using it due to the stressful situation of prisons.<sup>35</sup> Although substances

are expensive, they are easily found in prisons. The expensiveness and availability of injecting drug use encourage both groups who are injecting and who are not, to use drugs by injection.<sup>34</sup> Many studies reveal that the more common the injection drug use is among prisoners, the more needles are shared. Despite the access to drugs, it is hard to supply syringes and other injecting tools.<sup>34,38,39</sup> Addiction, abandonment pressure, stressful situation of prisons, high cost of drugs and lack of access to sterile equipment force

prisoners to ignore all warnings about dangers of injecting drug use.<sup>34</sup> In our study, the prison mainly contained prisoners who were sentenced on charge of theft, and 84% were studied for a history of drug use; we found a statistically significant association between HIV infection and the history of injecting drug use. Some studies have already found the history of injecting drug use as the most important risk factor for HIV transmission in Iran. In other studies, injecting drug use was introduced as the main risk factor for HIV infection.<sup>9,37</sup>

We analyzed the frequency of needle sharing among people with high risk behaviors based on prisoner's reports. About one third of drug users had a history of injection drug use, 15.6% with a history of needle sharing. So, it is important to consider this issue as a significant risk factor for HIV transmission. In other studies, needle sharing has been confirmed as an effective way of HIV transmission even in other countries.<sup>25,40,41</sup> According to a bio-behavioral surveillance on IDUs in 2014, despite 91.4% awareness about higher risk of HIV transmission when needles are shared, prisoners experienced unsafe injection. It was found that the rate of using new needles for the last injection was 81.5% among the target group. Also, using other shared equipment was 28.5% among IDUs.<sup>11</sup> In this study, tattooing is considered as a risk factor for HIV transmission, which was also recognized as a risk factor for IDUs in Thailand.<sup>41</sup>

The rates of using crystal meth recognized in this study and other researches reinforce the worry about increasing rate of unprotected sexual relationships.<sup>39,42</sup> The correlation between history of methamphetamine use and HIV infection was significant. A recent study showed that consumption of amphetamine-like drugs is increased among drug users and individuals under methadone maintenance therapy<sup>11</sup> and even prisoners are a source of concern about consumption of amphetamine-like drugs.<sup>9,11</sup> A bio-behavioral surveillance survey on injecting drug users in 2014 reported that 20.7% of IDUs used methamphetamine in the last month, and 21.1% of them had a history of crystal injection.<sup>11</sup> Also, using crystal meth combined with other drugs was common among prisoners. Based on comparative results found between a bio-behavioral surveillance study on prisoners in 2012 and the same study in 2009, the rate of using amphetamine-stimulating drugs was increased in the last month. The prevalence rate of using these drugs was 2.7% in the last month in 2009, which increased to 11.6% in 2012. In addition, injecting crystal was reported by 28.0%.<sup>11</sup> Another study in Iran indicated that using methamphetamine may increase unprotected sexual relationships. Furthermore, it results in dry mucosa and reduced sensation of pain, leading to increased risk of HIV transmission.<sup>43</sup> All these factors threaten the success of harm reduction programs. It seems inevitable to start studies for evaluation, planning and promotion of evidence-based interventions.

Although many researchers have confirmed the relationship between unprotected sexual activities and HIV transmission,<sup>8,18,25,44</sup> it was not supported by the present study. It may be caused by strong relationship with injecting drug use that covers the role of sexual relationship in HIV transmission. In univariate analysis, some variables related to unprotected sexual relationship showed statistical significance with HIV infection; however, this was not held in multivariate analysis. These variables included extramarital relationships, sex with multiple partners and spouse with risk factors. In many countries, the main cause of HIV epidemics is unprotected sexual relationships.<sup>44</sup> This result may be followed

by strong correlation between drug injection and HIV infection. In our study, 83.1% of prisoners used condom in their sexual relationships. The bio-behavioral surveillance on prisoners in 2009 showed a low rate of using condom in sexual relationships.<sup>9</sup>

The association between STI and HIV transmission has been confirmed by some studies.<sup>45-47</sup> In univariate analysis in our study, the history of STI and HIV infection were associated, unlike multivariate analysis. The reason may be similar to that mentioned above about unprotected sex.

Overall based on different studies, history of using an opioid in jail, older age (adjusted odds ratio 2.79 for 25–34, 3.01 for 35–44, 4.62 for ≥45 yr.), IDU, tattooing, promiscuity, heterosexuality and homosexuality, needle sharing, duration of imprisonment and duration of drug use had a significant correlation with HIV seropositivity in Iranian prisoners.<sup>12,23,24,48</sup>

One major limitation for our data is the potential possibility of under-reporting of sexual behaviors in jail, because of their illegal and sensitive condition. We believe it is very likely to be under-reported in this study. Another limitation to our data includes the lack of knowledge on the timing of infection in relation to the reported risk behaviors. In the end, a major limitation is that female prisoners were not included in our sample.

As a final result of our study, variables including age, duration of imprisonment, history of injecting drug use, history of needle sharing, and tattooing were independently associated with HIV infection. Although many of these high risk behavior occurred out of prison, but the prison setting provide an fantastic opportunity to control them. Since 2000, Iran has implemented a successful package of harm reduction services including methadone maintenance program that blunted HIV epidemic among prisoners. Therefore, HIV prevalence and risk factors among prisoners should be considered by policy makers to enhance strategic planning and guidelines for reduction of HIV risk factors. This will be helpful to control HIV prevalence even outside of the prison.

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## Conflict of interest

The authors have no conflict of interest.

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