

Original Article

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

SeyedAhmad SeyedAlinaghi MD M.Phil PhD^{1,2}, Behnam Farhoudi MD MPH³, Minoo Mohraz MD MPH¹, Fatemeh Golsoorat Pahlaviani MD¹, Mostafa Hosseini PhD⁴, Marzieh Farnia MD MPH⁵, Mohammad Shahbazi MD MPH⁶, Ramin Alasvand MD⁵, Mehrzad Tashakoriyan MD⁵

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 ≥ 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

Cite this article as: SeyedAlinaghi SA, Farhoudi B, Mohraz M, Golsoorat Pahlaviani F, Hosseini M, Farnia M, Shahbazi M, Alasvand R, Tashakoriyan M. Prevalence and Associated Factors of HIV Infection among Male Prisoners in Tehran, Iran. *Arch Iran Med.* 2017; 20(6): 356–360.

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.¹ 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.²

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

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.^{10,11} 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.^{12–14}

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,¹⁵ and communicating with agencies that provide medical care and health education.¹⁶

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.

Authors' affiliations: ¹Iranian Research Center for HIV/AIDS, Iranian Institute for Reduction of High Risk Behaviors, Tehran University of Medical Sciences, Tehran, Iran. ²Tehran Positive Club, Tehran, Iran. ³Clinical Research Development Center, Amir-almomenin Hospital, Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran. ⁴Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran. ⁵Health and Treatment Office of Iranian Prisons Organization, Tehran, Iran. ⁶GFATM Project Coordinator against HIV/AIDS and Tuberculosis Projects, United Nations Development Program, Prisons Organization, Tehran, Iran.

Corresponding author and reprints: Behnam Farhoudi, Address: Islamic Azad University, Tehran Medical Branch, Shariati Street, Gholhak, Tehran, Iran. Tel/ Fax: +98 (21) 22006660-7, E-mail: b_farhoudi@yahoo.com
Accepted for publication: 27 April 2017

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%).¹⁷ 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, 2860 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 ≥ 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.¹⁸ Here, the rate of HIV prevalence in prison was higher than the society. However, similar findings are also reported from other countries.^{1,19,20} In 2008, a study on all prisoners of Mazandaran, Iran, found seven individuals (0.3%) with HIV infection among 2405 prisoners.²¹ 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.²⁰ 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%).^{9,11} 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%.¹² In three studies conducted in Iran to evaluate the HIV prevalence among drug users, the results were 5.8% among 121 prisoners in Gorgan,²² 6.4% among 970 prisoners in Isfahan²³ and 15.1% among 252 prisoners in Bandar Abbas and Roodan.²⁴

In our study, most of the HIV positive patients were aged 25 to 34 years. Similar results have been reported in other studies.²⁵⁻²⁷ 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.²⁸⁻³¹

As reported by some studies in Australia³² and America,³³ HIV can rapidly and intensively spread in jails and involve the population of prisons.³⁴ Many factors may contribute to this.

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

Variable	N(%)	HIV ⁺ (N)	HIV Seroprevalence % (95% CI)
Age (year)¹			
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)
History of addiction²			
History of injection drug use ¹	851(29.8)	71	8.3(6.6–10.4)
History of sharing needles or equipment ¹	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 ²	2196(76.8)	56	2.6(2.0–3.4)
Sex with multiple partners (two or more, except wife) ³	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 ⁴	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 ¹	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 ³	22(0.8)	3	13.6(2.9–34.9)
Tend to HIV testing ¹	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)**
Number of imprisonment (times)¹			
1–3	1645(64.5)	32	1.9 (1.3–2.7)
≥4	906(35.5)	45	5.0 (3.6–6.6)
Duration of imprisonment (years)¹			
≤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)
Drugs reported used at the present (local name)			
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)**
Drugs reported used at the past (local name)			
Methamphetamine (Crystal) ²	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)

¹ $P \leq 0.0001$, ² $P = 0.02$, ³ $P = 0.03$, ⁴ $P = 0.04$, *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.^{35,36} 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.³⁷ Many prisoners are using drugs when admitted to the prison, and some start using it due to the stressful situation of prisons.³⁵ 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.³⁴ 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.^{34,38,39} 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.³⁴ 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.^{9,37}

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.^{25,40,41} 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.¹¹ 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.⁴¹

The rates of using crystal meth recognized in this study and other researches reinforce the worry about increasing rate of unprotected sexual relationships.^{39,42} 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 therapy¹¹ and even prisoners are a source of concern about consumption of amphetamine-like drugs.^{9,11} 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.¹¹ 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%.¹¹ 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.⁴³ 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,^{8,18,25,44} 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.⁴⁴ 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.⁹

The association between STI and HIV transmission has been confirmed by some studies.⁴⁵⁻⁴⁷ 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.^{12,23,24,48}

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 behaviors occurred out of prison, but the prison setting provide a 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.⁴⁹ On the other hand, this success is vulnerable and without these harm reduction services prison can fuel HIV epidemic. 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.

Acknowledgements

We thank all staff in the prisons for their help.

This study was part of a PhD dissertation supported by Tehran University of Medical Sciences (TUMS) (Grant No. 9021598014). This project was funded by UNODC in Iran.

Conflict of interest

The authors have no conflict of interest.

References

- Jürgens R, Nowak M, Day M. HIV and incarceration: prisons and detention. *J Int AIDS Soc.* 2011; 14: 26.
- World Health Organization (WHO). Evidence for action technical papers Effectiveness of Interventions to address HIV in prisons. Technical papers and policy brief on HIV/AIDS and injecting drug users in prisons. Geneva, Switzerland: WHO; 2007.
- Avert. Prisons and HIV/AIDS. Available from URL: <http://www.avert.org/prisoners-hiv-aids.htm> (Accessed: 2014)
- Spaulding AC, Seals RM, Page MJ, Brzozowski AK, Rhodes W, Hammett TM. HIV/AIDS among inmates of and releases from US correctional facilities, 2006: declining share of epidemic but persistent public health opportunity. *PLoS One.* 2009; 4(11): e7558.

5. Poulin C, Alary M, Lambert G, Godin G, Landry S, Gagnon H, et al. Prevalence of HIV and hepatitis C virus infections among inmates of Quebec provincial prisons. *CMAJ*. 2007; 177(3): 252 – 256.
6. Semaille C, Le Strat Y, Chiron E, Chemlal K, Valantin MA, Serre P, et al. Prevalence of human immunodeficiency virus and hepatitis C virus among French prison inmates in 2010: a challenge for public health policy. *Euro Surveill*. 2013; 18(28). pii: 20524.
7. World Health Organization (WHO). HIV in prisons. Available from: URL: www.euro.who.int/en/health-topics/communicable-diseases/hiv-aids/policy/policy-guidance-for-key-populations-most-at-risk-2/hiv-in-prisons.
8. Rotily M, Weilandt C, Bird SM, Käll K, Van Haastrecht HJ, Iandolo E, et al. Surveillance of HIV infection and related risk behaviour in European prisons. A multicentre pilot study. *Eur J Public Health* 2001; 11(3): 243 – 250.
9. Navadeh S, Mirzazadeh A, Gouya MM, Farnia M, Alasvand R, Haghdoost AA. HIV prevalence and related risk behaviours among prisoners in Iran: results of the national biobehavioural survey, 2009. *Sex Transm Infect*. 2013; 89(Suppl 3): iii33 – iii6.
10. Joint United Nations Programme on HIV/AIDS (UNAIDS). *Report on the global HIV/AIDS epidemic*. (UNAIDS). Geneva; 2002: 22 – 41, 80 – 107.
11. National AIDS Committee Secretariat, Ministry of Health and Medical Education. Islamic Republic of Iran, AIDS Progress Report on Monitoring of the United Nations General Assembly Special Session on HIV and AIDS (UNGASS); March 2015.
12. Kheirandish P, Seyedalinaghi SA, Hosseini M, Jahani MR, Shirzad H, Foroughi M, et al. Prevalence and correlates of HIV infection among male injection drug users in detention in Tehran, Iran. *J Acquired Immune Deficiency Syndrome*. 2010; 53(2): 273 – 275.
13. Ravlija J, Vasilj I, Marijanović I, Vasilj M. Risk behaviour of prison inmates in relation to HIV/STI. *Psychiatr Danub*. 2014; 26(Suppl 2): 395 – 401.
14. Khajehkazemi R, Haghdoost A, Navadeh S, Setayesh H, Sajadi L, Osooli M, et al. Risk and vulnerability of key populations to HIV infection in Iran; knowledge, attitude and practices of female sex workers, prison inmates and people who inject drugs. *Sex Health*. 2014; 11(6): 568 – 574.
15. Butler T, Richters J, Yap L, Donovan B. Condoms for prisoners: no evidence that they increase sex in prison, but they increase safe sex. *Sex Transm Infect*. 2013; 89(5): 377 – 379.
16. Hammett TM, Gaiter JL, Crawford C. Reaching seriously at-risk populations: health interventions in criminal justice settings. *Health Educ Behav*. 1998; 25(1): 99 – 120.
17. Uni-Gold™ Recombigen HIV rapid test instruction, published in FDA website. Available from: URL: www.fda.gov/downloads/BiologicsBloodVaccines/BloodBloodProducts/ApprovedProducts/PremarketApprovalsPMAs/ucm093428.pdf
18. Dufour A, Alary M, Poulin C, Allard F, Noël L, Trottier G, et al. Prevalence and risk behaviours for HIV infection among inmates of a provincial prison in Quebec City. *AIDS*. 1996; 10(9): 1009 – 1015.
19. World health organization (WHO). Evidence for action on HIV/AIDS and injecting drug use. Policy brief: reduction of HIV transmission in prison. Available from: URL: www.who.int/hiv/pub/idu/evidence_for_action/en (Accessed: 2004).
20. Dolan K, Kite B, Black E, Aceijas C, Stimson GV. HIV in prison in low-income and middle-income countries. *Lancet Infect Dis*. 2007; 7(1): 32 – 41.
21. Moosazadeh M, Amiresmaili M, Parsaei M, Ahmadi M, Jalahi H. The prevalence of tuberculosis among prisoners resident in Mazandaran prisons. *RUMS Magazine*. 2011; 10(4): 309 – 316.
22. Khodabakhshi B, Abbasi A, Fadaee F, Rabiee M. Prevalence and risk factors of HIV, hepatitis B virus and hepatitis C virus infections in drug addicts among Gorgan prisoners. *J Med Sci*. 2007; 7(2): 252 – 254.
23. Dibaj R, Ataie B, Yaran M, Nokhodian Z, Tayeri K, Zamanimoghadam A. Prevalence of HIV infection in inmates with history of injection drug use and evaluation of risk factors, in Isfahan, Iran. *Pak J Med Sci*. 2013; 29(Suppl 1): 399 – 402.
24. Davoodian P, Dadvand H, Mahoori K, Amoozandeh A and Salavati A. Prevalence of Selected Sexually and Blood-Borne Infections in Injecting Drug Abuser Inmates of Bandar Abbas and Roodan Correction Facilities, Iran, 2002. *Braz J Infect Dis*. 2009; 13(5): 356 – 358.
25. Long J, Allwright S, Barry J, Reynolds SR, Thornton L, Bradley F, et al. Prevalence of antibodies to hepatitis B, hepatitis C, and HIV and risk factors in entrants to Irish prisons: a national cross sectional survey. *BMJ*. 2001; 323(7323): 1 – 6.
26. Martin V, Cayla JA, Bolea A, Castill J. Mycobacterium tuberculosis and human immunodeficiency virus co-infection in intravenous drug users on admission to prison. *Int J Tuberc Lung Dis*. 2000; 4(1): 41 – 46.
27. Martin V, Cayla JA, Moris ML, Alonso LE, Pérez R. Predictive factors of HIV infection in injecting drug users upon incarceration. *Eur J Epid*. 1998; 14(4): 327-331.
28. Adoga MP, Banwat EB, Forbi JC, Nimzing L, Pam CR, Gyar SD, et al. Human immunodeficiency virus, hepatitis B virus and hepatitis C virus: sero-prevalence, co-infection and risk factors among prison inmates in Nasarawa State, Nigeria. *J Infect Dev Ctries*. 2009; 3(7): 539 – 547.
29. Butler T, Boonwaat L, Hailstone S, Falconer T, Lems P, Ginley T, et al. The 2004 Australian prison entrants' blood-borne virus and risk behaviour survey. *Aust N Z J Public Health*. 2007; 31(1): 44 – 50.
30. Burattini M, Massad E, Rozman M, Azevedo R, Carvalho H. Correlation between HIV and HCV in Brazilian Prisoners: evidence for parenteral transmission inside prison. *Rev Saude Publica*. 2000; 34(5): 431 – 436.
31. Weild AR, Gill ON, Bennett D, Livingstone SJ, Parry JV, Curran L. Prevalence of HIV, hepatitis B, and hepatitis C antibodies in prisoners in England and Wales: a national survey. *Communicable Disease and Public Health* 2000; 3: 121 – 126.
32. Dolan K, Wodak A. HIV transmission in a prison system in an Australian state. *Med J Aust*. 1999; 171(1): 14 – 17.
33. Kebs CP, Simmons M. Intraprison transmission: an assessment of whether it occurs, how it occurs, and who is at risk. *AIDS Educ prev*. 2002; 14(5 Suppl B): S53 – S64.
34. Des Jarlais DC, Friedman SR, Chopping K, et al. International epidemiology of HIV and AIDS among injecting drug users. *AIDS*. 1992;10(6):1053 – 1068.
35. Bollini P, Gunchenko A. Epidemiology of HIV/AIDS in prisons. In: Bollini P, ed. *HIV in Prisons*. Switzerland: World Health Organization; 2001.
36. World health organization: HIV and AIDS in place of detention: A toolkit for policymakers, programme managers, prison officers and health care providers in prison settings; 2008.
37. Bennett T, Sibbitt R. Drug use among arrestees. *NCJRS* 2000; NCJ number: 187822. Available from: URL: <https://www.ncjrs.gov/App/Publications/abstract.aspx?ID=187822>
38. Dye S, Isaacs C. Intravenous drug misuse among prison inmates, implication for spread of HIV. *BMJ* 1991; 302: 1506.
39. Allwright S, Bradley F, Long J, Barry J, Thornton L, Parry JV. Prevalence of antibodies to hepatitis B, Hepatitis C, and HIV and risk factors in Irish prisoners: results of a national cross sectional survey. *BMJ*. 2000; 321(7253): 78 – 82.
40. Wolfe D. Ilicit drug policies and the global HIV epidemic. *International Harm Reduction Development program*. New York; 2004.
41. Buavirat A, PageShafer K, van Griensven GJP, et al. Risk of prevalent HIV infection associated with incarceration among injecting drug users in Bangkok, Thailand: case control study. *BMJ*. 2003; 326(7384): 308.
42. Mwanri L, Moradmand Badie B. Community Involvement in HIV Prevention. In: SeyedAlinaghi SA, Sudinharaset M, eds. *Current Studies in HIV Research*. 1st ed. UAE: Bentham Science; 2015.
43. Mokri A, Schottenfeld R. Drug abuse and HIV transmission in Iran, Responding to the public health challenges. In: Celentano DD, Beyrer C, eds. *Public Health Aspects of HIV/AIDS in Low and Middle Income Countries*. New York: Springer; 2009: 583–599.
44. Joint United Nations Programme on HIV/AIDS (UNAIDS). *Global report: UNAIDS Report on the Global AIDS Epidemic 2013*. Geneva: WHO; 2010.
45. Sexton J, Garnett G, Rottingen JA. Metaanalysis and metaregression in interpreting study variability in the impact of sexually transmitted diseases on susceptibility to HIV infection. *Sex Transm Dis*. 2005; 32(6): 351 – 357.
46. Weinbaum C, Sabin K, Santibanez S. Hepatitis B, hepatitis C, and HIV in correctional populations: a review of epidemiology and prevention. *AIDS*. 2005; 19(Suppl 3): S41 – S46.
47. Rosen DL, Schoenbach VJ, Wohl DA, White BL, Stewart PW, Golin CE. Characteristics and behaviors associated with HIV infection among inmates in the North Carolina prison system. *Am J Public Health*. 2009; 99(6):1123 – 1130.
48. Dolan K, Moazen B, Noori A, Rahimzadeh S, Farzadfar F, Hariga F. People who inject drugs in prison: HIV prevalence, transmission and prevention. *Int J Drug Policy*. 2015; 26 (Supplement 1): S12 – S15.
49. Shahbazi M, Farnia M, Rahmani K, Moradi G. Trend of HIV/AIDS prevalence and related interventions administered in prisons of Iran – 13 Years' experience. *Iran J Pub Health*. 2014; 43: 471 – 4 79.