

Original Article

PREVALENCE OF COMMON BLOOD-BORNE INFECTIONS AMONG IMPRISONED INJECTION DRUG USERS IN MASHHAD, NORTH-EAST OF IRAN

Ali Rowhani-Rahbar MD^{•*}, Abbas Tabatabaee-Yazdi MD*, Mahmoud Panahi MD**

Background – Injection drug use plays an important role in the transmission of blood-borne viral infections among injection drug users (IDUs). The purpose of this study was to estimate the prevalence of the main four blood-borne infections in incarcerated IDUs in the Central Prison of Mashhad, the northeastern metropolis of Iran, and comparing it with the same rates in the society. It was also aimed of this study was to obtain some important demographic and risk behavior data of incarcerated IDUs.

Methods – The study population comprised a convenience sample of 101 incarcerated IDUs in Mashhad. A blood sample was taken from each subject in August 2001 and tested to detect hepatitis C, hepatitis B (HBsAg), human immunodeficiency virus (HIV), and human T-cell lymphotropic virus (HTLV-1) infection markers by enzyme-linked immunosorbent assay (ELISA) in the laboratory of the Blood Transfusion Organization. A confirmative western blot test was performed for the HIV-positive ones. The data regarding their demographic characteristics and injection-related and sexual risky behaviors were obtained through an interviewer-assisted questionnaire. The Mashhad University of Medical Sciences (MUMS) Thesis Committee reviewed all aspects of the research and approved the protocol.

Results – The seroprevalence of HCV, HBV (HBsAg), HIV, and HTLV-1 was 60%, 3%, 7%, and 52%, respectively. Forty-nine percent of the subjects shared their syringes or needles and 20% practiced frontloading. HCV and HTLV-1 infections were associated with injection-related risky behaviors, while no association was found between these infections and the variables pointing to sexual risky behaviors.

Conclusion – Given the high rates of the above-mentioned infections among IDUs found in this study and considering the concerning trend of drug addiction problem in Iran, there is an urgent need for effective harm reduction programs in Iran particularly among incarcerated IDUs.

Archives of Iranian Medicine, Volume 7, Number 3, 2004: 190 – 194.

Keywords: Blood-borne infections • hepatitis • HIV/AIDS • injection drug users • Mashhad

Introduction

Injection drug use is the main route of transmission for blood-borne viral infections in injection drug users (IDUs) and their sexual partners. Transmission is mainly parenteral through the sharing of contaminated injection equipment. The main causative agents of blood-borne viral infections are hepatitis C virus

(HCV), hepatitis B virus (HBV), human immunodeficiency virus (HIV), and human T-cell lymphotropic virus (HTLV).¹

Furthermore, it is generally accepted that confinement conditions increase the risk of such infections.² The increasing imprisonment rate of drug users is linked to the spread of these infections in prisons and several studies indicate a close correlation of imprisonment and transmission of infectious diseases.³

Considering the above points and regarding the increasing rate of addiction and injection drug use in Iran, this study aimed to investigate this problem as much as possible. The objective of this

Authors affiliations: *Department of Pathology, **Department of Infectious Disease, Mashhad University of Medical Sciences, Mashhad, Iran.

•Corresponding author and reprints: Ali Rowhani-Rahbar, MD, E-mail: ali.rowhanirahbar@yale.edu.

study was to estimate the prevalence rates of the main blood-borne infections among IDUs in a prison in Mashhad, the north-eastern metropolis of Iran, and to compare them with the same rates in the society. In addition, in this study, we intended to get a deeper insight into the present situation and epidemiological aspects of blood-borne infections in prisons of Iran by gathering the data regarding the demographic characteristics and risky behaviors of incarcerated IDUs.

Patients and Methods

The study population was a convenience sample of imprisoned IDUs in the Central Prison of Mashhad. Each IDU was verified either through visual inspection (due to the presence of numerous scars of injection) or if a health personnel of the prison setting identified him as an IDU. Taking blood samples started in prison in August 2001 was performed in one week on consenting IDUs ($n = 101$). Taking into consideration the fact that they injected usually into the veins of their upper extremities, blood samples were mostly taken from the femoral vein. Blood samples were sent to the laboratory of Blood Transfusion Organization for being tested for HCV, HBV, HIV, and HTLV-1. Blood samples were tested for the presence of anti-HCV, HBsAg, anti-HIV, and anti-HTLV-1 using enzyme-linked immunosorbent assay (ELISA) (BIO RAD, Japan). Western blot (Organon Teknika, Lia Tek HIV, Belgium) was used as a confirmatory test in HIV-positive cases detected by ELISA. To compare the rates of the aforementioned viral infections found in the incarcerated IDUs with those of the society, we used the viral infection rates calculated for the entire population of blood donors in Mashhad ($n = 60,892$) referred to the Blood Transfusion Organization (from March 2001 to March 2002). Imprisoned IDUs were also asked about their sociodemographic characteristics and risky behaviors using an interviewer-assisted questionnaire.

This research was conducted for the thesis component of the medical doctorate curriculum at

Mashhad University of Medical Sciences (MUMS) in 2001. The project was reviewed and sponsored by the MUMS Thesis Committee, the Central Prison of Mashhad, and the Blood Transfusion Organization of Khorasan Province. The MUMS Thesis Committee reviewed all aspects of the research with regard to ethical issues and approved the protocol in its entirety. No identification information was collected from incarcerated IDUs, and the chart reviews were performed confidentially. The participants were verbally informed that their participation in this study was voluntary. They were told that their blood samples would be tested for the detection of infectious diseases like HIV/AIDS and hepatitis. They were also ensured medical attention in the prison if they tested positive.

The research questionnaire was designed in Epi Info 2000 software (Centers for Disease Control and Prevention). Chi-square (Fisher's exact test whenever necessary) was used to examine the associations between self-reported risk behaviors and infection status. Measures of association (odds ratio) with 95% confidence interval were calculated. Statistical analyses were performed by Statistical Analysis Software (SAS) version 7 (SAS Institute Inc., Cary, North Carolina).

Results

Out of 101 incarcerated IDUs, 60 (59.4%), 3 (2.9%), 7 (6.9%), and 52 (51.5%) were reported to be positive for anti-HCV, HBsAg, anti-HIV, and anti-HTLV-1, respectively. Table 1 shows the comparison between these figures and those of the society calculated from the Blood Transfusion Organization records.

The mean age of the incarcerated IDUs was 32.8 (SD: 8.9) years. Sixty-five of them were married. Eighty-three cases were born in the city while the other 18 in rural areas. Forty-nine of them were simple workers and 43 lived in rental houses before imprisonment. The mean monthly income of the subjects was 851,234 (SD: 507,483) Rials (374 US dollars).

In addition to injection which was the main

Table 1. Comparing the rates of infection in imprisoned IDUs to the same rates among people referred to Blood Transfusion Organization (March 2001 – March 2002).

Infection	Prison ($n = 101$)	Blood Transfusion Organization ($n = 60,892$)	<i>p</i> Value
HCV	60 (59.4%)	59 (0.097%)	< 0.0001
HBsAg	3 (2.9%)	748 (1.23%)	0.11
HIV	7 (6.9%)	3 (0.005%)	< 0.0001
HTLV-1	52 (51.5%)	404 (0.663%)	< 0.0001

Table 2. Different methods of using drugs.

Methods	Frequency	Percentage
Injection	101	100
Smoking	35	34.6
Inhalation	21	20.8
Eating	8	7.9

route of drug use among the study population, smoking was the next most common method (Table 2). All of them injected heroin and some of them used other drugs such as opium, opium residue, and hashish (Table 3). Twenty-seven subjects had at least one addict family member.

Regarding risk behaviors, 49 (48.5%) of the subjects shared their syringes, 24 (23.8%) used common blade, 20 (19.8%) practiced frontloading, and 58 (57.4%) had tattoos. Fifty-six IDUs had a history of more than 3 times of previous imprisonment. Twenty-three IDUs (22.8%) had a history of sexually transmitted diseases (STD). Forty-one cases (40.6%) had multiple sexual partners, 12 (11.9%) were hetero- and homosexual, and 5 (4.9%) had no sexual partners.

In the next step, the relation between the HCV and HTLV-1 infections and some of the risky behaviors was evaluated; the complete results are shown in Table 4.

Discussion

Although, because of the convenience sampling, the results of this study can not be generalized to all incarcerated IDUs, they show the presence of these infections among them in such a high rates and give us a sketch of their general epidemiologic characteristics. The major finding of this study was the high rates of blood-borne viral infections among incarcerated IDUs. Several researches have shown a high prevalence of blood-borne viral infections among IDUs, prisoners, and

Table 3. Different kinds of used drugs.

Kind of drugs	Frequency	Percentage
Heroin (by injection)	101	100
Opium	24	23.8
Opium residue	6	5.9
Hashish	4	4

imprisoned IDUs in different parts of Asia.^{4 - 7} Significant outbreaks of HIV infection among IDUs have occurred in about half of the countries in North Africa and the Middle-East, notably in Iran. Most HIV transmissions in Iran have occurred among the country's estimated 200,000 to 300,000 IDUs.⁸ Sixty-five percent of the known and reported HIV cases in Iran have been attributed to injection drug use.⁹ About 10% of Iranian prisoners are believed to inject drugs and more than 95% of them are reported to share needles.⁸ A recent study in a local prison in Fars Province of Iran revealed prevalence rates of 30% and 78% for HIV and HCV infections among incarcerated drug users, respectively.¹⁰

High prevalence rates of HCV and HTLV-1 infections in this study are particularly of concern since the risk of future malignancies, even if drug users undergo abstinence treatment, could impose a heavy burden on the Iranian health care system. Numerous studies have been carried out throughout the world to investigate HCV prevalence, its epidemiological aspects, and its transmission dynamics in IDUs or prisoners.^{11 - 13} HCV has been present at high prevalence rates (amounting to 60% to 70%) in the population of Australian IDUs since as early as 1971.¹⁴ Similarly, in a study on HIV-seropositive IDUs in Manipur, India, the rate of infection by HCV reached 92%.⁶ HCV is readily transmitted parenterally whereas nonparenteral exposures (like unsafe sexual behaviors) have been found to be inefficient for transmission.¹⁵ In comparison to HCV, HTLV-1 has been studied less

Table 4. Association between HCV and HTLV-1 infections and risk behaviors.

Risk factors	HCV		OR (95% CI)	HTLV-1		OR (95% CI)
	Positive	Negative		Positive	Negative	
Sharing syringes (needles)	39	10	5.8* (2.4 - 14)	31	18	2.5* (1.1 - 5.7)
Frontloading	19	1	18.5* (2.4 - 145)	12	8	1.5 (0.6 - 4.1)
Using common blades	12	12	0.6 (0.2 - 1.5)	9	15	0.5 (0.2 - 1.2)
Tattoos	37	21	1.5 (0.7 - 3.4)	32	26	1.4 (0.6 - 3.1)
Multiple sexual partners	27	14	1.5 (0.7 - 3.5)	20	21	0.8 (0.4 - 1.8)
History of STD	13	10	0.9 (0.3 - 2.2)	13	10	1.3 (0.5 - 3.3)

OR = odds ratio; CI = confidence interval; STD = sexually transmitted diseases; *: $p < 0.05$.

extensively among IDUs.¹⁶ The high prevalence of HTLV-1 infection in Khorasan (the north-eastern province of Iran) and particularly in Mashhad,¹⁷ indicates that more attention should be paid to prevention and early detection of HTLV-1, especially among high-risk groups. Mashhad appears to be an important reservoir of HTLV-1 infection, with 2% to 3% seropositivity in its general population.¹⁸

Low rates of HBV infection seems to be due to the test utilized in this study to find HBsAg. Only three percent of the cases tested positive for HBsAg, indicating either current hepatitis B infection or a carrier state. This result is consistent with some of the previous studies.¹⁹ If the blood samples had been tested for anti-HBc, we might have obtained a higher rate because anti-HBc would be positive just if the case had ever been exposed to the virus.

A noticeable percentage of the subjects in this research were simple workers and lived in rental houses. Their mean monthly income was below the relative poverty line. Furthermore, many of them had the history of previous incarcerations. This is of great importance considering the fact that the history of several previous incarcerations and longer duration of imprisonment increase the probability of being infected by blood-borne infections.^{2, 3, 20}

Special attention should be paid to the risky behaviors that can transmit such infections among IDUs. Our results corroborate with the findings of other studies which have shown that infected IDUs compared to noninfected ones are significantly more likely to have shared their syringes/needles.^{21, 22} Moreover, we showed that frontloading was associated with an increased risk of infection. Frontloading is a major risk factor for transmitting such infections.²³ Furthermore, tattooing which can transmit these viruses,²¹ was obviously common among IDUs in this study. Though, in our study, having tattoos was associated with an increased risk of HCV and HTLV-1 infections, these associations did not gain statistical significance. Conditions of the prison and any kind of confinement can increase the probability of transmitting these infections. Incarceration is related to incident HIV infection through multiple pathways.²⁰ In addition, coinfection of these viral agents is not rare among imprisoned IDUs which in turn can result in an increased morbidity and mortality rates.²⁴

Given the high prevalence of the four main blood-borne infectious diseases in this study and the increasing rate of IDUs in Iran,²⁵ harm reduction programs are urgently needed. There should be programs for preventing and reducing the duration of drug use, particularly injection drug use. Several studies have shown that the prevalence of blood-borne infections increases with longer duration of injection drug use which is likely to reflect an effect of cumulative exposure.^{15, 26, 27} Harm reduction programs should include education, encouraging to stop drug use, preparing sterile syringes for those IDUs who can not discontinue injection drug use (syringe exchange programs), and increasing the number of detoxification and opioid-agonist maintenance treatment centers.

Acknowledgment

This study was conducted through close collaboration with the authorities of the Central Prison of Mashhad, Blood Transfusion Organization of Khorasan, and Mashhad University of Medical Sciences (MUMS). Special thanks are due to Dr. Ali Babaei, MD, Deputy Head of the Khorasan Prison Organization for his sincere collaboration, and Dr. Abolhassan Nadim, MD, PhD from the Academy of Medical Sciences of Islamic Republic of Iran, who proposed carrying out this research.

References

- 1 Nakamura Y. The blood-borne viral infections. *Rinsho Byori*. 1998; **46**: 107 – 118.
- 2 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**: 431 – 436.
- 3 Keppler K, Stover H. Transmission of infectious diseases during imprisonment—results of a study and introduction of a model project for infection prevention in Lower Saxony [in German]. *Gesundheitswesen*. 1999; **61**: 207 – 213.
- 4 Zhang C, Yang R, Xia X, et al. High prevalence of HIV-1 and hepatitis C virus coinfection among injection drug users in the south-eastern region of Yunnan, China. *J Acquir Immune Defic Syndr*. 2002; **29**: 191 – 196.
- 5 Singh S, Prasad R, Mohanty A. High prevalence of sexually transmitted and blood-borne infections amongst the inmates of a district jail in northern India. *Int J STD AIDS*. 1999; **10**: 475 – 478.
- 6 Saha MK, Chakrabarti S, Panda S, et al. Prevalence of HCV and HBV infections amongst HIV seropositive

- intravenous drug users and their noninjecting wives in Manipur, India. *Indian J Med Res.* 2000; **111**: 37 – 9.
- 7 Ichimura H, Kurimura O, Tamura I, Tsukue I, Tsuchie H, Kurimura T. Prevalence of blood-borne viruses among intravenous drug users and alcoholics in Hiroshima, Japan. *Int J STD AIDS.* 1995; **6**: 441 – 443.
 - 8 UNAIDS. AIDS Epidemic Update: December 2002. Available from: URL: <http://www.who.int/hiv/pub/epidemiology/epi2002/en/>.
 - 9 Ministry of Health. HIV/AIDS in Iran. The Ministry of Health, Treatment, and Medical Education of Iran, Deputy of Health; 2002.
 - 10 Nassirimanesh B. Proceedings of the Fourth National Harm Reduction Conference, Seattle, USA; 2002. Abstract.
 - 11 Bell J, Batey RG, Farrell GC, Crewe EB, Cunningham AL, Byth K. Hepatitis C virus in intravenous drug users. *Med J Aust.* 1990; **153**: 274 – 276.
 - 12 Girardi E, Zaccarelli M, Tossini G, Puro V, Narciso P, Visco G. Hepatitis C virus infection in intravenous drug users: prevalence and risk factors. *Scand J Infect Dis.* 1990; **22**: 751 – 752.
 - 13 Hagan H. Hepatitis C virus transmission dynamics in injection drug users. *Subst Use Misuse.* 1998; **33**: 1197 – 1212.
 - 14 Crofts N, Jolley D, Kaldor J, van Beek I, Wodak A. Epidemiology of hepatitis C virus infection among injecting drug users in Australia. *J Epidemiol Community Health.* 1997; **51**: 692 – 697.
 - 15 Garfein RS, Vlahov D, Galai N, Doherty MC, Nelson KE. Viral infections in short-term injection drug users: the prevalence of the hepatitis C, hepatitis B, human immunodeficiency, and human T-lymphotropic viruses. *Am J Public Health.* 1996; **86**: 655 – 661.
 - 16 Henrard DR, Soriano V, Robertson E, et al. Prevalence of human T-cell lymphotropic virus type 1 (HTLV-1) and HTLV-2 infections among Spanish drug users measured by HTLV-1 assay and HTLV-1 and -2 assays. HTLV-1 and HTLV-2 Spanish Study Group. *J Clin Microbiol.* 1995; **33**: 1735 – 1738.
 - 17 Tavanai-Sani A. Serologic prevalence of HTLV among blood donors in Mashhad (northeastern Iran). *Arch Iranian Med.* 2001; **4**: 25 – 26.
 - 18 Nerurkar VR, Achiron A, Song KJ, et al. Human T-cell lymphotropic virus type I in Iranian-born Mashhadi Jews: genetic and phylogenetic evidence for common source of infection. *J Med Virol.* 1995; **45**: 361 – 366.
 - 19 Shrestha SM, Shrestha DM, Gafney TE, Maharjan KG, Tsuda F, Okamoto H. Hepatitis B and C infections among drug abusers in Nepal. *Trop Gastroenterol.* 1996; **17**: 212 – 213.
 - 20 Choopanya K, Des Jarlais DC, Vanichseni S, et al. Incarceration and risk for HIV infection among injection drug users in Bangkok. *J Acquir Immune Defic Syndr.* 2002; **29**: 86 – 94.
 - 21 Samuel MC, Doherty PM, Bulterys M, Jenison S.A. Association between heroin use, needle sharing, and tattoos received in prison with hepatitis B and C positivity among street-recruited injecting drug users in New Mexico, USA. *Epidemiol Infect.* 2001; **127**: 475 – 484.
 - 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 infections among injecting drug users in Berlin. *Int J Epidemiol.* 1997; **26**: 1359 – 1366.
 - 23 Stark K, Muller R, Bienzle U, Guggenmoos-Holzmann I. Frontloading: a risk factor for HIV and hepatitis C virus infection among injecting drug users in Berlin. *AIDS.* 1996; **10**: 311 – 3117.
 - 24 Pallas JR, Farinas-Alvarez C, Prieto D, Delgado-Rodriguez M. Coinfections by HIV, hepatitis B, and hepatitis C in imprisoned injecting drug users. *Eur J Epidemiol.* 1999; **15**: 699 – 704.
 - 25 Mokri A. Brief overview of the status of drug abuse in Iran. *Arch Iranian Med.* 2002; **5**: 184 – 190.
 - 26 Pallas J, Farinas-Alvarez C, Prieto D, Llorca J, Delgado-Rodriguez M. Risk factors for mono-infections and coinfections with HIV, hepatitis B, and hepatitis C viruses in northern Spanish prisoners. *Epidemiol Infect.* 1999; **123**: 95 – 102.
 - 27 Murrill CS, Weeks H, Castrucci BC, et al. Age-specific seroprevalence of HIV, hepatitis B virus, and hepatitis C virus infections among injection drug users admitted to drug treatment in 6 US cities. *Am J Public Health.* 2002; **92**: 385 – 387.