

## Brief Report

# Seroprevalence and Related Risk Behaviors of Hepatitis C, Hepatitis B and HIV Infections among Male Prisoners in Kermanshah, Iran

Nahid Khademi, MD<sup>1</sup>; Ebrahim Shakiba, MD, PHD<sup>1</sup>; Mahmoud Khodadost, PhD Student<sup>2</sup>; Malihe Khoramdad, PhD Student<sup>2\*</sup><sup>1</sup>Faculty of Health, Kermanshah University of Medical Sciences, Kermanshah, Iran<sup>2</sup>Department of Epidemiology, School of Public Health, Iran University of Medical Science, Tehran, Iran**Abstract**

Blood-borne infections are life-threatening challenges among prisoners. The aim of this study was to determine the prevalence of these infections and related risk behaviors among male prisoners. This cross-sectional study was performed on 1,034 voluntarily enrolled male prisoners in several prisons of Kermanshah province, Iran. All participants completed a questionnaire and were interviewed by an expert. To test the presence of hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) infections, 5-mL samples of blood were collected from all participants. Multivariable logistic regression was used to assess the association of HBV, HCV and HIV infections with the related risk factors. Totally, 1034 male prisoners participated in the current study. The mean age of subjects was  $35.52 \pm 8.12$  years, with a range of 19-64 years. The prevalence rates of HBsAg+, HCVAb+, and HIVAb+ in male prisoners were 1.25% (95% CI: 0.67-2.14), 22.2% (95% CI: 19.7-24.2), and 3.09% (95% CI: 2.1-4.3), respectively. Backward logistic regression analysis demonstrated a marked association between history of intravenous drug use and HBsAg+. There was also a positive association between HCVAb+ and age, region, age at the time of first substance use, and history of intravenous drug use and camp residency, as well as heterosexual relationships. HIV infection was also significantly associated with history of intravenous drug use and homosexual relationships. Although HBV infection was shown to be lower in Kermanshah than other parts of the country, a higher prevalence was found for HCV and HIV infections in this province.

**Keywords:** HIV, Hepatitis B, Hepatitis C, Iran, Prisons**Cite this article as:** Khademi N, Shakiba E, Khodadost M, Khoramdad M. Seroprevalence and related risk behaviors of hepatitis C, Hepatitis B and HIV infections among male prisoners in Kermanshah, Iran. Arch Iran Med. 2019;22(10):588-591.

Received: February 14, 2019, Accepted: September 8, 2019, ePublished: October 1, 2019

**Introduction**

Prisoners are at higher risk of infection with blood-borne viruses which is mostly attributed to their high risk behaviors including unsafe drug injection, unprotected sexual intercourse, and tattoos.<sup>1</sup> We aimed to determine the seroprevalence and related risk behaviors of hepatitis C, hepatitis B and HIV infections among male prisoners in Kermanshah, Iran.

**Materials and Methods**

This cross-sectional study was performed in Kermanshah, a province in western Iran. A total of 1034 prisoners were enrolled by census during a 6-month period in 2017.

Data were collected during face-to-face interviews using a standard questionnaire, which was based on the regional center of surveillance system education for HIV/AIDS (World Health Organization Fellow Center) with partial modification according to other provincial needs. The validity and reliability of this questionnaire were confirmed by experts. It comprises several important variables including demographic information, high risk variable, and sexual activity. In order to detect HBV,

HCV, and HIV, a 5-mL blood sample was collected from each individual using sterile syringes. The enzyme-linked immune-sorbent assay (ELISA) was performed as a confirmatory test for cases with positive results in rapid test. Seropositive samples for hepatitis B antigens and hepatitis C antibody were considered as positive hepatitis B and hepatitis C patients, respectively. Individuals with one positive rapid test and two positive ELISA tests were considered as positive for AIDS.

**Statistical Analysis**

The prevalence rates of HBV, HCV, and HIV were estimated with 95% confidence intervals (95% CI). Multivariable logistic regression analysis was used to assess the association of HBV, HCV and HIV infections with the related risk factors. All statistical analyses were performed using the Stata statistical Package v. 11.

**Results****Characteristics of Subjects**

In general, 1034 male prisoners participated in our study, with a mean age of  $35.52 \pm 8.12$  years. Eighty-five

\*Corresponding Author: Malihe Khoramdad, PhD student; Hemmat Highway, Near Milad Tower, Iran University of Medical Sciences, Tehran, Iran. Email: m.khoramdad2016@gmail.com

*Archive of SID*

percent (886) were current cigarette smokers, with their first cigarette at a mean age of  $18.01 \pm 6.08$  years. Also, 366 subjects (35.4%) had a history of hookah smoking, starting at a mean age of  $19.09 \pm 5.21$  years. Furthermore, 93% (967) and 78.05% (807) of subjects experienced substance use and alcohol drinking, respectively, at least once in their life time. The prevalence rates of HBsAg+, HCVAb+ and HIVAb+ in male prisoners were 1.25 %

(95% CI: 0.67–2.14), 22.2% (95% CI: 19.7–24.2) and, 3.09% (95% CI: 2.1–4.3); respectively (Table 1).

**Association between HBV and its Risk Factors**

In univariate logistic regression analysis, there was a significant association between history of intravenous drug use (odds ratio [OR] = 4.9, 95% CI: 1.55–15.48) and presence of HBsAg+. Also, in backward logistic regression

**Table 1.** Distribution of Risk Factors by HBV, HCV and HIV Biomarkers in Male Prisoners

Variables	HBs Ag			HCV Ab			HIV Ab		
	Negative	Positive	P-Value	Negative	Positive	P-Value	Negative	Positive	P-Value
<b>Age (y)</b>									
<25	67 (6.6)	0	0.65	63 (7.8)	4 (1.7)	0.003	67 (6.7)	0	0.28
≥25	954 (93.4)	13 (100)		741 (92.2)	226 (98.3)		935 (93.3)	32 (100)	
<b>Region</b>									
Rural	129 (12.6)	0	0.82	116 (14.4)	14 (6.1)	0.001	128 (12.8)	1 (3.1)	0.17
Urban	892 (87.4)	13 (100)		688 (85.5)	216 (93.9)		874 (87.2)	31 (96.9)	
<b>Marital status</b>									
Single	462 (45.9)	5 (38.5)	0.14	350 (43.5)	117 (50.9)	0.85	448 (44.7)	19 (59.4)	0.77
Married	448 (43.9)	4 (30.8)		376 (46.8)	76 (33)		448 (44.7)	4 (12.5)	
Divorced	111 (10.9)	4 (30.8)		78 (9.7)	37 (16.1)		106 (10.6)	9 (28.1)	
<b>Life time substance use</b>									
No	67 (6.6)	0	0.65	66 (8.2)	1 (0.4)	0.002	67 (6.7)	0	0.28
Yes	954 (93.4)	13 (100)		738 (91.8)	229 (99.6)		935 (93.3)	32 (100)	
<b>Age at the time of first substance use</b>									
<25	764 (80.1)	8 (72.2)	0.43	568 (77.2)	204 (89.1)	<0.001	742 (79.5)	30 (93.8)	0.08
≥25	190 (19.9)	3 (27.3)		168 (22.8)	25 (10.9)		191 (20.5)	2 (6.3)	
<b>History of intravenous drug use (IDU)</b>									
No	814 (85.3)	6 (54.5)	0.007	664 (90.2)	156 (68.1)	<0.001	808 (86.6)	12 (37.5)	<0.001
Yes	140 (14.7)	5 (45.5)		72 (9.8)	73 (31.9)		125 (13.4)	20 (62.5)	
<b>History of methamphetamine use</b>									
No	284 (27.8)	2 (15.4)	0.41	247 (30.7)	39 (17)	<0.001	279 (27.8)	7 (21.9)	0.51
Yes	737 (72.2)	11 (84.6)		557 (69.3)	191 (83)		723 (72.2)	25 (78.1)	
<b>History of MMT</b>									
No	561 (54.9)	7 (53.8)	0.91	472 (58.7)	96 (41.7)	<0.001	558 (55.7)	10 (31.3)	0.009
Yes	460 (45.1)	6 (46.2)		332 (41.3)	134 (58.3)		444 (44.3)	22 (68.8)	
<b>Camp residency</b>									
No	536 (52.5)	7 (53.8)	0.93	454 (56.5)	89 (38.7)	<0.001	530 (52.9)	13 (40.6)	0.17
Yes	485 (47.5)	6 (46.2)		350 (43.5)	141 (61.3)		472 (47.1)	19 (59.4)	
<b>History of heterosexual relationships</b>									
No	414 (40.5)	7 (53.8)	0.33	325 (40.4)	(96)47.1	0.71	410 (40.9)	11 (34.4)	0.48
Yes	607 (59.5)	6 (46.2)		479 (59.6)	(134)58.3		592 (59.1)	21 (65.6)	
<b>History of homosexual relationships</b>									
No	926 (90.7)	13 (100)	0.47	740 (92)	199 (86.5)	0.01	915 (91.3)	24 (75)	0.002
Yes	95 (9.3)	0		64 (8)	31 (13.5)		87 (8.7)	8 (25)	
<b>History of anal sex</b>									
No	854 (83.6)	12 (92.3)	0.57	676 (84.1)	190 (82.6)	0.56	839 (83.7)	27 (84.4)	0.95
Yes	167 (16.4)	1 (7.7)		128 (15.9)	40 (17.4)		163 (16.3)	5 (15.6)	
<b>Total</b>	<b>1021 (98.7)</b>	<b>13 (1.3)</b>		<b>804 (77.8)</b>	<b>230 (22.2)</b>		<b>1002 (96.9)</b>	<b>32 (3.1)</b>	

MMT, methadone maintenance therapy.

## Archive of SID

analysis, there was a significant association between history of intravenous drug use (OR = 4.07, 95% CI: 1.21–13.58) and presence of HBsAg+.

### Association between HCV and its Risk Factors

In univariate logistic regression analysis, life time substance use (OR = 13.77, 95% CI: 2.71–69.98), age  $\geq$  25 years (OR = 4.31, 95% CI: 1.63–11.34), divorced status (OR = 0.60, 95% CI: 0.43–0.83), urban background (OR = 2.60, 95% CI: 1.46–4.62), age at the time of first substance use (OR = 0.42, 95% CI: 0.26–0.65 for age  $\geq$  25 group); history of intravenous drug use (OR = 1.45, 95% CI: 1.09–1.82), history of methamphetamine use (OR = 2.15, 95% CI: 1.48–3.12), history of methadone maintenance therapy (MMT) (OR = 1.98, 95% CI: 1.47–2.66), camp residency (OR = 2.05, 95% CI: 1.52–2.76), and homosexual relationships (OR = 1.81, 95% CI: 1.15–2.85) were remarkably associated with presence of HCV. Finally, in backward logistic regression analysis, age  $\geq$  25 years (OR = 6.49, 95% CI: 1.97–21.36), urban background (OR = 2.25, 95% CI: 1.24–4.11), age at the time of first substance use (OR = 0.45, 95% CI: 0.28–0.72 for age  $\geq$  25 group); history of intravenous drug use (OR = 3.71, 95% CI: 2.52–5.45), camp residency (OR = 1.66, 95% CI: 1.20–2.30), and history of heterosexual relationships (OR = 0.63, 95% CI: 0.45–0.88) showed a significant association with the presence of HCV.

### Association between HIV and its Risk Factors

In univariate logistic regression analysis, there was a significant association between the presence of HIV and divorced status (OR = 2.05, 95% CI: 0.91–4.58), history of methadone maintenance therapy (OR = 2.69, 95% CI: 1.28–5.66), and history of homosexual relationships (OR = 3.62, 95% CI: 1.61–8.16). Finally, in backward logistic regression analysis, we identified a significant association between the presence of HIV infection and history of intravenous drug use (OR = 4.30, 95% CI: 2.97–6.22) and history of homosexual relationships (OR = 2.43, 95% CI: 1–5.87).

### Discussion

Our findings showed that the overall prevalence rates of HBV, HCV and HIV in male prisoners were 1.25%, 22.24% and 3.09%, respectively. The prevalence of HBV was lower compared reports from other countries that range from 2.4% to 47%<sup>2-5</sup> and also lower than the figures reported from other provinces of Iran – 3.8% to 6.9%<sup>6-8</sup>; this finding may be due to providing harm reduction programs.<sup>9</sup> Although HBV infection was shown to be lower than other regions of the country, HCV and HIV showed greater prevalence.<sup>10-12</sup> The most important common risk factors for HIV, HCV and HBV in our study were history of intravenous drug use, age above 25 years, urban prisoners, age at the time of first substance

use, camp residency, and heterosexual and homosexual relationships that was consistent with other studies.<sup>4,13</sup>

In conclusion, although HBV infections were shown to be lower in Kermanshah compared to other parts of the country, HCV and HIV showed greater prevalence. Serological screening at the time of admission, treatment of positive cases, and providing facilities to reduce transmission can be useful effective steps in decreasing the prevalence of infectious diseases among inmates.

### Authors' Contribution

NKH and ESH developed the idea and designed the study. MKH performed the data analysis and data interpretation with the support and monitor of MKH. MKH drafted the manuscript with the support of MKH, NKH, and ESH. All authors reviewed the manuscript, provided feedback, and MKH applied comments and finalized the manuscript.

### Conflict of Interest Disclosures

None.

### Ethical Statement

The participants were informed about the project and a written consent was obtained from all of them before data collection. The study protocol was approved by the Ethics committee of Kermanshah University of Medical Sciences (irkums.rec.1396.86).

### Acknowledgments


The authors gratefully acknowledge the research council of Kermanshah University of Medical Sciences (Grant Number: 96165) for the financial support.

### References

- Weinbaum CM, Sabin KM, Santibanez SS. Hepatitis B, hepatitis C, and HIV in correctional populations: a review of epidemiology and prevention. *AIDS*. 2005;19 Suppl 3:S41-6.
- Maher L, Chant K, Jalaludin B, Sargent P. Risk behaviors and antibody hepatitis B and C prevalence among injecting substance users in south western Sydney, Australia. *J Gastroenterol Hepatol*. 2004;19(10):1114-20. doi: 10.1111/j.1440-1746.2004.03438.x
- De La Hoya PS, Marco A, García-Guerrero J, Rivera A, Group PS. Hepatitis C and B prevalence in Spanish prisons. *Eur J Clin Microbiol Infect Dis*. 2011;30(7):857-62. doi: 10.1007/s10096-011-1166-5.
- 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. doi:10.1136/bmj.321.7253.78
- Mahfoud Z, Kassak K, Kreidieh K, Shamra S, Ramia S. Prevalence of antibodies to human immunodeficiency virus (HIV), hepatitis B and hepatitis C and risk factors in prisoners in Lebanon. *J Infect Dev Ctries*. 2010;4(3):144-9.
- Ziaee M, Sharifzadeh G, Namaee MH, Fereidouni M. Prevalence of HIV and hepatitis B, C, D infections and their associated risk factors among prisoners in Southern Khorasan Province, Iran. *Iran J Public Health*. 2014;43(2):229-34.
- Khani M, Vakili MM. Prevalence and risk factors of HIV, hepatitis B virus and hepatitis C virus infections in drug addicts among Zanjan prisoners. *Arch Iran Med*. 2003;6(1):1-4
- Behnaz K, Abdollah A, Fateme F, Mohammadreza R. 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):252-4.

*Archive of SID*

9. Alam-mehrjerdi Z, Abdollahi M, Higgs P, Dolan K. Substance use treatment and harm reduction programs in Iran: A unique model of health in the most populated Persian Gulf country. *Asian J Psychiatr.* 2015;16:78-83. doi: 10.1016/j.ajp.2015.06.002.
10. Davoodian P, Dadvand H, Mahoori K, Amoozandeh A, 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):356-8. doi: 10.1590/S1413-86702009000500008.
11. Kassaian N, Adibi P, Kafashaian A, Yaran M, Nokhodian Z, Shoaie P, et al. Hepatitis C virus and associated risk factors among prison inmates with history of drug injection in Isfahan, Iran. *Int J Prev Med.* 2012;3(Suppl 1):S156-61.
12. Alizadeh AHM, Alavian SM, Jafari K, Yazdi N. Prevalence of hepatitis C virus infection and its related risk factors in drug abuser prisoners in Hamedan-Iran. *World J Gastroenterol.* 2005;11(26):4085-9. doi: 10.3748/wjg.v11.i26.4085
13. Moradi G, Gouya MM, Azimizan Zavareh F, Mohamadi Bolbanabad A, Darvishi S, Aghasadeghi MR, et al. Prevalence and risk factors for HBV and HCV in prisoners in Iran: a national bio-behavioural surveillance survey in 2015. *Trop Med Int Health.* 2018;23(6):641-649. doi: 10.1111/tmi.13065.

 © 2019 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.