

Seroprevalence of hepatitis B markers among incarcerated intravenous drug users

Zary Nokhodian, Majid Yaran¹, Peyman Adibi², Nazila Kassaian, Marjan Meshkati³, Behrooz Ataei⁴

Infectious Diseases and Tropical Medicine Research Center, ¹Acquired Immunodeficiency Research Center, ²Department of Gastroenterology, Integrative Functional Gastroenterology Research Center, ³Isfahan Province Health Center, ⁴Nosocomial Infection Research Center, Isfahan University of Medical Sciences, Isfahan, Iran

Background: Drug injection is one of the most prominent risk factors for transmission of viral hepatitis. Prevalence of hepatitis B virus (HBV) is generally higher in prisoners compared with the general population. The object of this study was to assess the markers of HBV and related risk factors among intravenous drug users (IVDU) in prisoners. **Materials and Methods:** Through a cross-sectional study in 2012 HBV infection and its risk factors were assessed in prisoners with a history of intravenous drug use in Isfahan, Iran. A checklist was fulfilled for each participant and 5 ml blood was taken from each subject. Sera were analyzed for markers of the hepatitis B: Hepatitis B virus surface antigen (HBsAg), antibody to hepatitis B virus surface antigen (HBsAb) and hepatitis B virus core antibody (HBcAb) by ELISA. We used Chi-square test and logistic regression model to analyze data and $P < 0.05$ was considered to be significant. **Results:** All of the studied participants ($n = 970$) were men. The mean \pm standard deviation of the age of the subjects was 32.61 ± 8.1 years and the majority of them had less than high school education. More than 40% of these men had a history of injection drug inside prison and 2.27% of them self-reported history of HBV infection. Of the 970 IVDU, 32 (3.3%) were positive for HBsAg. Among HBsAg + subjects, 23 (71.88%) were HBcAb+. 120 (12.37%) were found positive for isolated HBsAb, 45 (4.64%) for isolated HBcAb and 67 (6.9%) for both HBsAb and HBcAb. History of sharing needle (odds ratio: 2.25, 95% confidence interval: 1.09-4.65) had a significant association with HBsAg positivity. **Conclusion:** The results suggest that history of sharing needle had a significant association with HBsAg positivity. It seems that educational programs for injecting drug related behaviors, especially syringe sharing, are needed for IVDU.

Key words: Hepatitis B virus, intravenous drug users, Isfahan, Prison

How to cite this article: Nokhodian Z, Yaran M, Adibi P, Kassaian N, Meshkati M, Ataei B. Seroprevalence of hepatitis B markers among incarcerated intravenous drug users. *J Res Med Sci* 2014;19:S13-S16.

INTRODUCTION

Injecting drug use is a worldwide public health problem with 16 million people injected drugs in 2007.^[1] Drug injection is one of the most important risk factors for transmission of viral hepatitis.^[2] The transmission of these diseases in intravenous drug users (IVDU) is caused by using sharing injection equipment such as needle, syringes and other paraphernalia.^[3,4] Studies have documented that the prevalence rate of hepatitis B virus (HBV) infection is higher among IVDU.^[5,6] 16% of acute viral hepatitis subjects reported to the Center for Disease Control and prevention had recent use of injected drugs as a risk factor.^[7]

Hepatitis B virus is a health problem and the main cause of chronic hepatitis, hepatocellular carcinoma, and cirrhosis.^[8] It is estimated that 2 billion people have been exposed to this virus at some time in their lives and between 350 and 400 million are chronic carriers of HBV.^[9] Chronic viral hepatitis B infection causes

about 1 million deaths annually.^[8] HBV infection may be transmitted vertically from mothers to their newborn infants or horizontally by means of body secretions and blood products. The researches showed that needle-stick injuries in health personnel, shared needles in drug abusers, tattooing, ear and nose piercing practices, and hemodialysis have been associated with increased risk of transmission.^[10]

HBV infection is considered as “desmoteretic” infections, which mean its prevalence is generally higher in prisoners than in nonprisoners. Many studies showed that incarceration is a significant predictor of HBV infection.^[11-13] According to limited studies in Iran, the HBV infection prevalence varies among incarcerated injection drug users from 3% to 4.5% in different parts of the country.^[13-15] The risk factors before arrest such as injection drug use, high-risk sexual behaviors and poor access to health care and also factors after capture such as sexual harassment, body piercing and nonprofessional tattooing may play important roles in the higher

Address for correspondence: Dr. Behrooz Ataei, Infectious Diseases and Tropical Medicine Research Center, Isfahan University of Medical Sciences, Isfahan, Iran. E-mail: ataei@med.mui.ac.ir

Received: 07-01-2014; **Revised:** 21-01-2014; **Accepted:** 02-03-2014

prevalence of HBV among prisoners in comparison with the general population.^[16]

Hepatitis B infection puts a heavy burden on the health care system because of the cost of treatment of liver diseases. Exact data on the prevalence of this infection is required for suitable prevention and control of this disease. A large number of prisoners are drug addicts;^[17,18] thus, we assess HBV markers and the related risk behaviors among IVDU prisoners in Isfahan, Iran.

MATERIALS AND METHODS

This cross-sectional study was performed at March 2012 in two prisons in Isfahan province, Iran. There were a total of 11 prisons in Isfahan province; we selected two prisons, the central prison and Asadabad Camp, because the most of IVDU prisoners were resident in these prisons. Prisoners were enrolled if they had intravenous drug history. We defined, an IVDU as “a person using any kind of injectable drug for at least 1 time.”^[19] The purpose of the study was fully explained to inmates and participation in the study was voluntary. It was emphasized that the study information would remain confidential and an informed consent was obtained from each subject. A checklist was completed to assess prisoners’ demographic characteristics (such as age, level of education, and nationality) and HBV-related risk behavior like marital status, sexual behaviors, use of shared injecting equipment, dental procedures, and history of blood transfusion,^[10,20,21] by a trained staff with a face-to-face interview. Interviews were individually done. The research protocol was approved by the Ethics Committee of the Isfahan University of Medical Sciences (Project No: 291072).

A volume of 5 ml of blood was drawn from each subject. The blood samples were transported to the laboratory of Infectious Diseases Research Center, Isfahan, during 2-5 h in the cold box and were then centrifuged and serum was separated. The separated serum was transferred to a sterile tube and then stored at -70°C until processing.^[17] Markers of the HBV: Hepatitis B virus surface antigen (HBsAg), antibody to hepatitis B virus surface antigen (HBsAb) and hepatitis B virus core antibody (HBcAb) were tested using fourth generation enzyme immunoassays (Acon, USA).

The data was analyzed using SPSS software (version 16.0, 2007, SPSS Inc., Chicago, IL, USA). Bivariate analysis was performed using Chi-square test to assess the association between risk factors and HBV markers. Multiple logistic regression was used for the significant variables in the bivariate analysis as explanatory variables to calculate adjusted odds ratio and 95% confidence intervals (CI). $P < 0.05$ was considered as statistically significant.

RESULTS

All of the study participants ($n = 970$) were male with a mean age of 32.61 ± 8.14 ; the youngest and oldest were 18 and 67 years old, respectively. 3.6% of the subjects had never attended school, 38.3% had attended primary school, 40% had attended guidance school, and 15.7% had reached high school and only 2.4% had more than a high school education. The majority of prisoners were Iranian (Iranian: 98.8%, Afghan: 1.1%, Indian: 0.1%). Overall, 521 (55.4%) had ever been married. Among the married persons, 460 (92.2%) had been married once, 34 (6.8%) had been married twice and 5 (1%) had been married more. Of those interviewed 43.1% had sex with men and 64.4% had more than one heterosexual partner, among whom 30.9% mentioned to use a condom during sex. The mean of frequency of intravenous injections was 54 times/month. 40.3% of the cases had a history of injection drug inside prison. 762 prisoners reported a history of alcohol consumption. 22 out of 970 inmates self-reported a history of HBV infection.

Of the 970 incarcerated injection drug users, 32 (3.3%) were found positive for HBsAg. 23 (2.37%) HBsAg-positive subjects had positive HBcAb results that were compatible with chronic HBV, 144 (14.85%) were HBsAg-positive and/or HBcAb positive that were compatible with past or current infection.^[22] Only one prisoner was positive for all markers of HBV infection. Among the studied subjects, 120 (12.37%) and 45 (4.64%) were positive for isolated HBsAb and isolated HBcAb, respectively. Sixty-seven were positive for both HBsAb and HBcAb that were compatible with previously cured infection. There was a significant association between HBsAg positivity and history of sharing needle ($P = 0.04$) [Table 1]. The logistic regression model also showed statistically significant relationships between the HBsAg and positive history of sharing needle (odds ratio: 2.25, 95% CI: 1.09-4.65).

DISCUSSION

In this study, prevalence of HBV markers was assessed among IVDU in prisons in Isfahan province. Our results indicated that the prevalence of HBsAg seropositivity was 3.3% among these inmates. Other similar studies in Iran have shown similar results. The prevalence of HBsAg in incarcerated IVDU in Mashhad, a province in the north of Iran, was reported to be 2.9% by Rowhani-Rahbar *et al.*^[14] In a study of four prisons in Iran from 401 IVDU, 17 persons (4%) were HBsAg-positive.^[18] In a prison in Gorgan, Iran, 4.1% of prisoners were positive for HBsAg.^[23] The prevalence of HBsAg in drug addicts’ prisoners was reported to be 3.8% in Zanjan, a province in the west of Iran.^[24] In Mir-Nasseri *et al.* study, the HBsAg positivity among IVDU prisoners in Tehran, Iran was 4.5%.^[13]

Table 1: Bivariate analysis of HBV markers

Characteristics	HBsAg+		HBsAg+ or/and HBcAb+		HBcAb+	
	N (%)	P value	N (%)	P value	N (%)	P value
Tattooing	19 (3.4)	0.9	82 (14.5)	0.9	76 (13.5)	0.93
Cupping	13 (3.6)	0.64	51 (13.9)	0.76	46 (12.6)	0.5
Surgery	17 (3.6)	0.38	69 (14.7)	0.82	64 (13.6)	0.96
Blood transfusion	10 (5.3)	0.07	31 (16.4)	0.37	28 (14.8)	0.55
Periodontal procedure	1 (1.5)	0.72	9 (13.6)	0.86	9 (13.6)	0.98
Dental extraction	27 (3.4)	0.68	119 (15)	0.3	111 (14)	0.32
Had sex with men or having >1 heterosexual partner	23 (3.4)	0.76	102 (15.1)	0.29	96 (14.2)	0.31
Sharing needle	17 (4.8)	0.04*	60 (17)	0.07	53 (15.1)	0.29
Total	32 (100)		144 (100)		127 (100)	

* $P < 0.05$; HBV = Hepatitis B virus; HBsAg = hepatitis B virus surface antigen; HBcAb = Hepatitis B virus core antibody

Although the HBsAg prevalence is still low in the IVDU in prisons of Iran, taking into account the similarity in transmission routes of this virus with HCV, the high rate of infection with HCV in IVDU and also the increasing number of injection drug users, it can be predicted that there is a high chance of increase in the incidence of HBV infection in the near future.

Since the high-risky behaviors in IVDU frequently happen, we assessed some risk factors associated with HBV positivity. The results of this study showed participants who had a history of shared drug injection were more likely to be positive for HBsAg. There are enough evidences to support that injecting drug use and syringe sharing are common among IVDU in prison.^[25,26] The risk of syringe contamination by this virus is higher in prisons than outside where syringes are commonly shared with only one or two other subjects.^[27] In most of the prisons, the lack of access to new syringes or other injecting equipment results in prisons acting as an incubator for HBV epidemic. Some countries intend to control this risk factor in prisons and have managed prison-based needle exchange programs. A few studies documented that the provision of syringes for IVDU in prisons may contribute to a considerable reduction of syringe sharing.^[28]

Results showed that more than 80% of these men had no immunity against hepatitis B. Unfortunately, we did not ask about their vaccination program. Prisons are not separated places from the community. Many inmates spend short periods in prison and some prisoners contact with their families during their vacation, or after completion of their incarceration, therefore this population can transfer infections to the community. On the other hand, in prisons there are suitable opportunities to contact large numbers of IVDU for long periods and it is possible that they transfer this infection to each other. Therefore, antibody testing for immunity against HBV and implementation program on immunization of this high-risk group should be considered.

In our study, the HBcAb could be detected in 35.83% of the HBsAg positive population, demonstrating that the

immunity against hepatitis B has still been acquired through virus exposure in a substantial portion of subjects.

Prevalence of different markers of HBV infection among men in the general population in Isfahan province were reported 1.8%, 13.7%, and 4.4% for HBsAg, HBsAb, and HBcAb, respectively.^[29] Comparison of the results of the general population with our data shows that these markers are more prevalent among incarcerated IVDU than the general population. These findings indicate that prisons in Iran could be also high-risk places for infection transmission and they can have an important effect on the rate of infection.

This study has some limitations. The vertical transmission of HBV from HBsAg-positive mothers to their infants at birth or in early infancy has been considered a possible route for the spread of infection that might explain the maintenance of the virus in populations before the use of needles. Unfortunately, we did not ask prisoners about it. In addition, in our check list there was no question about intra-familial transmission and liver diseases. Furthermore, we did not measure variables such as knowledge, attitudes and perception of risks which might have an important impact on the risk of this infection.

CONCLUSION

The results suggest that sharing needle had a significant association with HBsAg positivity. It seems that educational programs for injecting drug related behaviors, especially syringe sharing are needed for IDUs. This finding could be an important evidence for harm-reduction policies in Iran.

AUTHORS' CONTRIBUTION

All authors have contributed in designing and conducting the study. ZN, MY, NK and MM collected the data and PA, BA, and ZN did the analysis. All authors have assisted in preparation of the first draft of the manuscript or revising it critically for important intellectual content. All authors

have read and approved the content of the manuscript and are accountable for all aspects of the work.

REFERENCES

- Mathers BM, Degenhardt L, Phillips B, Wiessing L, Hickman M, Strathdee SA, *et al.* Global epidemiology of injecting drug use and HIV among people who inject drugs: A systematic review. *Lancet* 2008;372:1733-45.
- 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;34:431-6.
- Buavirat A, Page-Shafer K, van Griensven GJ, Mandel JS, Evans J, Chuaratanaphong J, *et al.* Risk of prevalent HIV infection associated with incarceration among injecting drug users in Bangkok, Thailand: Case-control study. *BMJ* 2003;326:308.
- Samuel MC, Doherty PM, Bulterys M, Jenison SA. 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;127:475-84.
- Patti AM, Santi AL, Pompa MG, Giustini C, Vescia N, Mastroeni I, *et al.* Viral hepatitis and drugs: A continuing problem. *Int J Epidemiol* 1993;22:135-9.
- 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;321:78-82.
- Rivas I, Martinez E, Sanvisens A, Bolao F, Tor J, Torrens M, *et al.* Hepatitis B virus serum profiles in injection drug users and rates of immunization over time in Barcelona: 1987-2006. *Drug Alcohol Depend* 2010;110:234-9.
- Lavanchy D. Hepatitis B virus epidemiology, disease burden, treatment, and current and emerging prevention and control measures. *J Viral Hepat* 2004;11:97-107.
- Merican I, Guan R, Amarapuka D, Alexander MJ, Chutaputti A, Chien RN, *et al.* Chronic hepatitis B virus infection in Asian countries. *J Gastroenterol Hepatol* 2000;15:1356-61.
- Alizadeh AH, Ranjbar M, Ansari S, MirArab A, Alavian SM, Mohammad K, *et al.* Seroprevalence of hepatitis B in Nahavand, Islamic Republic of Iran. *East Mediterr Health J* 2006;12:528-37.
- Weinbaum C, Lyster R, Margolis HS, Centers for Disease Control and Prevention. Prevention and control of infections with hepatitis viruses in correctional settings. *Centers for Disease Control and Prevention. MMWR Recomm Rep* 2003;52:1-36.
- Pallás J, Fariñas-Alvarez C, Prieto D, Llorca J, Delgado-Rodríguez 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.
- Mir-Nasseri MM, Mohammadkhani A, Tavakkoli H, Ansari E, Poustchi H. Incarceration is a major risk factor for blood-borne infection among intravenous drug users: Incarceration and blood borne infection among intravenous drug users. *Hepat Mon* 2011;11:19-22.
- Rowhani-Rahbar A, Rooholamini S, Khoshnood K. Prevalence of HIV infection and other blood-borne infections in incarcerated and non-incarcerated injection drug users (IDUs) in Mashhad, Iran. *Int J Drug Policy* 2004;15:151-5.
- Salem F, Aghasadeghi M, Javadi F, Roohvand F, Joolae M, Bahramali G, *et al.* Using RFLP-PCR and direct sequencing to determine HBV genotypes in intravenous drug user prisoners in Tehran province. *Razi J Med Sci* 2010;17:56-65.
- Marques NM, Margalho R, Melo MJ, Cunha JG, Melo-Silvestre AA. Seroepidemiological survey of transmissible infectious diseases in a Portuguese prison establishment. *Braz J Infect Dis* 2011;15:272-5.
- Lin CF, Twu SJ, Chen PH, Cheng JS, Wang JD. Prevalence and determinants of hepatitis B antigenemia in 15,007 inmates in Taiwan. *J Epidemiol* 2010;20:231-6.
- Pourahmad M, Javady AA, Karimi I, Ataei B, Kassaian N. Seroprevalence of and risk factors associated with hepatitis B, hepatitis C, and human immunodeficiency virus among prisoners in Iran. *Infect Dis Clin Pract* 2007;15:368-72.
- Recommendations for Testing, Managing, and Treating Hepatitis C. USA: Infectious Diseases Society of America; c2014. Available from <http://www.hcvguidelines.org/node/69>. [Last cited on 2014 Feb 24].
- Goldstein ST, Alter MJ, Williams IT, Moyer LA, Judson FN, Mottram K, *et al.* Incidence and risk factors for acute hepatitis B in the United States, 1982-1998: Implications for vaccination programs. *J Infect Dis* 2002;185:713-9.
- Mahboobi N, Agha-Hosseini F, Mahboobi N, Safari S, Lavanchy D, Alavian SM. Hepatitis B virus infection in dentistry: A forgotten topic. *J Viral Hepat* 2010;17:307-16.
- Dienstag J. Chronic hepatitis. In: Longo D, Fauci A, Kasper D, Hauser S, Jameson J, Loscalzo J, editors. *Harrison's Principles of Internal Medicine*. 18th ed. New York: The McGraw-Hill Companies; 2012. p. 2567-88.
- Khodabakhshi B, Abbassi 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;7:252-4.
- 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;6:1-4.
- Zamani S, Ichikawa S, Nassirimanesh B, Vazirian M, Ichikawa K, Gouya MM, *et al.* Prevalence and correlates of hepatitis C virus infection among injecting drug users in Tehran. *Int J Drug Policy* 2007;18:359-63.
- Covell RG, Frischer M, Taylor A, Goldberg D, Green S, McKeganey N, *et al.* Prison experience of injecting drug users in Glasgow. *Drug Alcohol Depend* 1993;32:9-14.
- Müller R, Stark K, Guggenmoos-Holzmann I, Wirth D, Bienzle U. Imprisonment: A risk factor for HIV infection counteracting education and prevention programmes for intravenous drug users. *AIDS* 1995;9:183-90.
- Crofts N, Caruana S, Bowden S, Kerger M. Minimising harm from hepatitis C virus needs better strategies. *BMJ* 2000;321:899.
- Nokhodian Z, Kassaian N, Ataei B, Javadi A, Shoaee P, Farajzadegan Z, *et al.* Hepatitis B markers in Isfahan, Central Iran: A population-based study. *Hepat Mon* 2009;9:12-6.

Source of Support: Nil, **Conflict of Interest:** The authors have no conflict of interest.