

# Hepatitis C Virus and Associated Risk Factors among Prison Inmates with History of Drug Injection in Isfahan, Iran

Nazila Kassaian<sup>1</sup>, Peyman Adibi<sup>2</sup>, Alireza Kafashaian<sup>3</sup>, Majid Yaran<sup>1</sup>, Zary Nokhodian<sup>1</sup>,

Parisa Shoaee<sup>1</sup>, Razieh Hassannejad<sup>1</sup>, Anahita Babak<sup>1</sup>, Behrooz Ataei<sup>1</sup>

<sup>1</sup>Infectious Diseases and Tropical Medicine Research Center, Isfahan University of Medical Sciences, Isfahan, Iran.

<sup>2</sup>Department of Gastrology, Integrative functional Gastroenterology Research Center, Isfahan University of Medical Sciences, Isfahan, Iran. <sup>3</sup>Department of Health, Prison Organization, Isfahan, Iran.

## Correspondence to:

Behrooz Ataei

Associate Professor, Infectious Diseases and Tropical Medicine Research Center, Isfahan University of Medical Sciences, Isfahan, Iran.

Email: ataei@med.mui.ac.ir

Date of Submission: Sep 7, 2011

Date of Acceptance: Nov 19, 2011

**How to cite this Article** Kassaian N, Adibi P, Kafashaian A, Yaran M, Nokhodian Z, Shoaee P, et al. Seroprevalence and Risk Factors of Hepatitis C Virus among Juveniles in Correctional Center in Isfahan, Iran. *Int J Prev Med* 2012; Special issue, S156-61.

## ABSTRACT

**Objectives:** Hepatitis C virus (HCV) infection is a major public health problem worldwide with serious complications. According to the importance of intravenous drug use (IDU) as the main risk factor for HCV infection and transmission and prison as the main source of risky behaviors, this study conducted to define HCV infection and related risk factors in prison inmates with history of IDU in Isfahan province, Iran.

**Methods:** This is a cross-sectional study which the prison inmates with IDU history in voluntary basis were enrolled. A validated questionnaire was asked and blood sample was obtained from each subject for the presence of HCV antibody. Odds ratio and logistic regression were used for data analysis and  $P$ -value  $< 0.05$  considered significant.

**Results:** 1943 inmates with history of IDU participated in the study. The overall prevalence of HCV antibody was 41.6%. The main independent risk factors were number of injection in the month [OR: 1.006 (1.002- 1.011)], Length of drug addiction [OR: 1.05 (1.004-1.098)], multiple incarceration [OR: 1.15 (1.05-1.23)] and use of needle/syringe share inside prison [OR: 4.19 (2.22-7.9)]. In our study, marriage was a protective factor for HCV infection [OR: 0.34 (0.18-0.64)] as well.

**Conclusions:** According to relatively high prevalence of HCV infection and associated risk factors which observed in this study it is important to primary prevention in prisons through syringe/needle exchange and counsel with imprisoned IDUs.

**Keywords:** HCV, IDU, prison

## INTRODUCTION

Hepatitis C virus (HCV) is a major public health problem all over the world; it is currently estimated that about 85% of those infected with hepatitis C virus will become a chronic carrier and may develop severe end stage liver diseases including cirrhosis and hepatocellular carcinoma.<sup>[1,2]</sup> Currently, the most important risk factor for infecting by hepatitis C is intravenous drug use (IDU) which is the most associated with the sharing of drug injection equipments especially needles, syringes and other paraphernalia.<sup>[3]</sup> Infection with HCV among prison inmates is usually

higher than that among the general population mainly because of past history of intravenous drug use and possibly high risk addiction-related behaviors in prison.<sup>[4]</sup>

During the last few years, much attention has been given to the prevalence of blood born diseases including hepatitis C among prisoners.<sup>[5]</sup>

According to limited research studies in Iran, prevalence of HCV infection among prisoners with a history of drug injecting varies between 31.5% to 47% in different parts of the country.<sup>[6-8]</sup>

However, a study in a local prison in Fars province revealed 78% prevalence rates of HCV infection among incarcerated drug users.<sup>[9]</sup>

To address the often hidden phenomenon of HCV infection in prisons, it is important to identify and quantify correlates of infection among inmates.<sup>[4]</sup>

Considering the limited data on the epidemiology of HCV infection and related risk behaviors in our region, in this study we have focused on this infection and transmission risk factors among prisoners with history of IDU in Isfahan that could potentially be incorporated into current and future harm reduction initiatives in Iran.

## METHODS

In a cross-sectional study, according to self-report and confirm by head of prison's health-care, the prison inmates who had intravenous drug history or current IDUs entered into study at March 2009. The study included an interview and blood testing.

Since the most of our enrollees had sclerosis in peripheral vessels, blood sampling was mostly taken from the femoral vein by the health personnel of the prison setting. They were trained on sampling safety consideration and filling questionnaire. Blood samples were then sent to the laboratory of Infectious Diseases Research Center during 3 hours in cold box to be tested by EILSA (Diapro-Italy) for the presence of HCV antibody. Incarcerated with IDU histories were also asked about their demographic characteristics and HCV-related risk behaviors with an interviewer assisted questionnaire. Face and

content validity of the questionnaire were evaluated by specialists and its reliability was confirmed by Chronbach alpha = 0.74.

The research protocol was approved by the Ethical committee of Isfahan University of Medical Sciences in Iran. Participation in the study was on a voluntary basis and after obtaining informed consent. All available means were used to guarantee privacy during interviews and confidentiality.

Instead of a block for the patient's name, each questionnaire and test tube had an anonymous identification code, which was used for reporting laboratory results, too.

Statistical analysis was performed using SPSS for windows (Version 16.0, 2007, SPSS Inc, Chicago, IL, USA).

Univariate analysis was used to assess association between being HCV positive and related risk factors. The variables that were significant in the univariate analysis ( $P$ -value < 0.05) were included in the multiple logistic regression to estimate adjusted odds ratio (AOR) and 95% confidence intervals (CI).

## RESULTS

A total of 943 incarcerated IDUs (938 male and 5 female) participated in the study. The median age of participants was 32.6 years (Range: 18-67). The majority of participants (98.6%) were Iranian and 523 (55.5%) had ever been married. Among the married persons 451 (92%) had been married once, 35 (7%) had been married twice and 5 (1%) had been married more. 143 (15.1%) cases mentioned a history of traveling to another countries. Table 1 shows the socio-demographic characteristics.

Overall, the prevalence of HCV-Ab seropositivity was 41.6% [Table 1].

Table 2 shows the prevalence of HCV risk factors in the subjects. The median frequency of IV injections was 30 times per month (Range 1-500), the median duration of addiction was 12 years (Range 0.5-57), the median frequency of incarceration was 3 times (Range 1-37), and the median of total duration of incarceration was 3.66 years (Range 0.08-35).

**Table 1.** The Socio.demographic characteristics of participants

Characteristics	Number (%)	
Alcohol consumption	764 (81.1%)	
Education	Illiterate	23 (3.6%)
	Elementary school	242 (38.3%)
	Junior high school	253 (40%)
	High school	31 (4.9%)
	Diploma	69 (10.8%)
Place of residence	University	15 (2.4%)
	Urban	583 (89.7%)
Job situation	Rural	67 (10.3%)
	Have a Job	553 (85.9%)
	Have not Job	91 (14.1%)

71.76% of the participants had illegal sex (contact with other than spouse). Among whom, 43% of men had history of having sex with another man (MSM), 64.2% had an intercourse with commercial sex workers and 30.9% of them had IDU sexual partner. According to self reports, only 31% of them had ever used a condom during sex. Within all studied samples with IDU history, 13.3% had a single sexual partner and the others had 2 or more, in their lifetime.

Table 3 shows the odds Ratio for some risk

characteristics of IDUs using the logistic Regression Model. Variables shown in the table were controlled for basic demographic characteristics.

## DISCUSSION

The results of this study indicated that overall prevalence of HCV Ab seropositivity among IDU inmates in Isfahan province is 41.6%. In similar studies in Iran, similar results were observed. In Zakizad *et al.*<sup>[8]</sup> study, the seroprevalence of hepatitis C infection in Sari addict prisoners has been reported as 30.8%.

**Table 2.** Frequency of HCV transmission related factors within study population

Characteristics	No (Percent)	Non adjusted OR (95%CI)
Marriage	523 (55.5)	0.57 (0.44-0.74)*
Tattooing	566 (60.2%)	2.43 (1.84-3.2)*
Cupping	367 (39.3%)	1.04 (0.79-1.35)
Surgery	471 (50.5%)	1.13 (0.87-1.47)
Periodontal procedure	66 (7%)	0.97 (0.58-1.61)
Dental caries repair	348 (36.9%)	0.77 (0.59-1.01)
Dental extraction	795 (84.4%)	1.11 (0.78-1.59)
Illegal sex	676 (71.7%)	2.26 (1.66-3.07)*
Ever injected a drug inside prison	376 (40.1%)	5.04 (3.80-6.69)*
Ever shared a syringe/needle	352 (37.4%)	6.24 (4.67-8.35)*
Number of injection per month (Mean $\pm$ SD)	54.42 $\pm$ 71.38	1.009 (1.006-1.01)*
Length of drug addiction (year) (Mean $\pm$ SD)	12.53 $\pm$ 7.42	1.05 (1.03-1.07)*
Multiple incarceration (Mean $\pm$ SD)	4.43 $\pm$ 4.63	1.14 (1.09-1.20)*
duration of recent incarceration (month) (Mean $\pm$ SD)	25.77 $\pm$ 32.98	1.004 (1.00-1.008)*
Total duration of incarceration (year) (Mean $\pm$ SD)	5.05 $\pm$ 4.65	1.11 (1.07-1.15)*

**Table 3.** Adjusted risk factors of variables in multiple logistic regression model

Characteristics	Adjusted OR	95%CI
Marriage <sup>a</sup>	0.34	0.18-0.64*
Tattooing <sup>a</sup>	1.29	0.67-2.49
Illegal sex <sup>a</sup>	0.75	0.38-1.51
Number of injection (per month)	1.006	1.002-1.011*
Length of drug addiction (year)	1.05	1.0004-1.098*
Multiple incarceration	1.15	1.05-1.23*
Hx of shared drug injecting inside prison <sup>a</sup>	4.19	2.22-7.90*

a, yes = 0; no = 1 (Reference category)

\* *P*-value < 0.05

In another study by Khani *et al.*<sup>[10]</sup> the prevalence of HCV was 47.7% among drug addict prisoners in Zanjan. In a study which was done in 3 provinces in Iran (Isfahan, Chahamahal Bakhtiary and Lorestan) in 2003, 34.7% of male prisoners who had been imprisoned for various drug-related offenses including purchase or sale and consumption, were HCV Ab positive.<sup>[7]</sup>

In Mashhad, the seroprevalence of HCV in incarcerated IDUs had been reported as 59.4%.<sup>[6]</sup> In Mohammad Alizadeh *et al.*<sup>[11]</sup> study, the HCV antibody positivity among drug abusers in the central prison of Hamedan was 30%.

In a study on drug abusers admitted to prison in Guilan province, of 460 inmates, 45.4% were HCV antibody positive which in intravenous drug abusers the prevalence reached to 88.9%.<sup>[12]</sup>

The prominent aspect of our study in comparison with other similar studies in Iran, is the high number of participants whom all of them had history of intravenous addiction. As a matter of fact, this is one of the first large prevalence studies of blood-borne infections among incarcerated IDUs in Iran.

In this study, the history of shared drug injection inside prison was one of the main incarceration-related risk factors. This association, has also been reported in other studies in the world.<sup>[13-15]</sup>

It seems that, the lack of access new needle/syringe in prisons and consequently needle sharing practice is the main reason of the hepatitis C epidemic in prisoners.<sup>[16]</sup> Our data, highlight for comprehensive and integrated in-

terventions for incarcerated IDUs to prevent HCV transmission among IDU population and community.

Effectiveness of needle programs in reducing needle sharing among IDUs has been shown in many countries.<sup>[17]</sup> In our country, an outreach program for blood born infections prevention was supported by the United Nation and the Ministry of Health of Iran in 2003.<sup>[18]</sup>

Multiple incarcerations was the another independent risk factor in our subjects which show that the high rates of arrests and incarcerations lead to drug-related offences or other confounding factors inside prison, such as violence.<sup>[7]</sup>

Our findings suggest that preventive interventions are compelling now for IDUs to ensure their safe passage throughout incarceration.

In our study, other important modes of transmission were frequency and length of drug injection. According to these results, harm reduction strategies need to be expanded to prevent new HCV infections, particularly among young injectors.<sup>[19-20]</sup>

In our study, history of marriage was a protective factor for HCV-infection in the subjects after controlling for all other variables in the logistic-regression model.

Sexual transmission could play a role in sporadic or community-acquired HCV infections.

However, there is contradictory finding regarding the association between marriage and HCV infection in the world.<sup>[21]</sup>

Vandelli and colleagues<sup>[22]</sup> indicated that the risk of sexual transmission of HCV within

heterosexual monogamous couples is extremely low or even null.

It is shown that, those who have multiple sexual partners, including female sex workers, men having sex with men, and attendees of sexually-transmitted diseases (STDs) clinics are the main risk groups for hepatitis C.<sup>[23 4]</sup>

In the Acute Hepatitis Surveillance Study in USA, 18% of newly infected individuals reported sexual contact with an HCV-infected person or multiple sexual partners as their only risk factor for HCV acquisition.

For the individual with chronic HCV infection, the estimated risk of sexual transmission of virus was 0% to 0.6% per year for those in monogamous relationships, and 1% per year for those with multiple sexual partners.<sup>[24]</sup>

So, it will be useful to encourage young people to get married to prevent sexually transmitted diseases in our society.

## CONCLUSION

In conclusion, according to progressive reported prevalence rates of HCV in the world and the importance of the current and potential burden of HCV-related complications, it is important to primary prevention of HCV infection that will be addressed through implementation of safe injection practices<sup>(25)</sup>. The mortality associated with hepatitis C is expected to double in the next 10-20 years. It is conservatively estimated that the direct costs related to hepatitis C will be \$10.3 billion during the years 2010-2020. The indirect costs of hepatitis C (eg, the loss of productivity during that era) are estimated to total another \$54.3 billion due to premature death and \$20.6 billion due to disability. In addition, the total cost of therapy for hepatitis C is estimated to be \$10,000-\$12,000. Hepatitis C considerably lowers life-expectancy benefits as well.

So, primary prevention will be more cost-effective than secondary prevention of morbidity and mortality from HCV infection through provision of interferon-based therapy. It is good opportunities in prison to have large number of IDUs over longer period to do specific preven-

tive activities such as needle/syringe exchange and counsel imprisoned IDUs.

## ACKNOWLEDGMENTS

The authors are grateful to Research Council of Isfahan University of Medical Sciences for financial support of this study.

## REFERENCES

1. 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. In *J Drug Policy* 2007;18:359-63.
2. Thomas DL, Astemborski J, Rai RM. The natural history of hepatitis C virus infection: Host, viral, and environmental factors. *JAMA* 2000;284:450-6.
3. Crofts N, Jolley D, Kaldor J, Wodak A. Epidemiology of hepatitis C virus infection among injecting drug users in Australia. *J Epidemiol Community Health* 1997;51:692-7.
4. Vescio MF, Longo B, Babudieri S, Starnin G, Carbonara S, Rezza G, *et al.* Correlates of hepatitis C virus seropositivity in prison inmates: A meta-analysis. *J Epidemiol Community Health* 2008;62:305-13.
5. Matheï C, Buntinx F, Van Damme P. Seroprevalence of hepatitis C markers among intravenous drug users in western European countries: A systematic review. *J Viral Hepat* 2002;9:157-73.
6. 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.
7. 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.
8. Zakizad, M.; Salmeh, F.; Yaghoobi, T.; Yaghoobian, M.; Nesami, M. B.; Esmaeeli, Z.; *et al.* Seroprevalence of hepatitis C infection and associated risk factors among addicted prisoners in Sari -Iran. *Pak J Biol Sci* 2009;12:1012-8.
9. Mirahmadizadeh AR, Kadivar MR, Hemmati AR, Javadi A. Infection with HIV and hepatitis C and B viruses among injecting drug users in Shiraz, Southern Iran. *International AIDS Conference* 2004;15:16.
10. Khani M, Vakili MM. Prevalence and risk factors of

- HIV, hepatitis B virus and hepatitis C virus infection in drug addicts among Zanjan prisoners. *Arch Iran Med* 2003;6:1-4.
11. Mohammad Alizadeh AH, 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;11:4085-9.
  12. Mohtasham Amiri Z, Rezvani M, Jafari Shakib R, Jafari Shakib A. Prevalence of hepatitis C virus infection and risk factors of drug using prisoners in Guilan province. *East Mediterr Health J* 2007;13:250-6.
  13. 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 infection among injecting drugusers in Berlin. *Int J Epidemiol* 1997;26:1359-66.
  14. 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.
  15. Hellard ME, Hocking JS, Crofts N. The prevalence and the risk behaviors associated with the transmission of hepatitis C virus in Australian correctional facilities. *Epidemiol Infect* 2004;132:409-15.
  16. Alavian SM. Hepatitis C infection in Iran; A review article. *Iran J Clin Infect Dis* 2009;4:47-59.
  17. Crofts N, Caruana S, Bowden S, Keger M. Minimising harm from hepatitis C virus needs better strategies. *BMJ* 2000;321:899.
  18. Vazirian M. Review of drug demand reduction programs in Iran: Advices for development and strategic planning. *SOCIAL WELFARE* ???2003;9:145-201.
  19. Zali MR, Aghazadeh R, Nowroozi A, Amir-Rasouly H. Anti-HCV antibody among Iranian IV drug users: Is it a serious problem? *Arch Iran Med* 2001;4:115-9.
  20. Shepard CW, Finelli L, Alter MJ. Global epidemiology of hepatitis C virus infection. *Lancet Infect Dis* 2005;5:558-67.
  21. Paez Jimenez A, Mohamed MK, Eldin NS, Seif HA, El Aidi S, Sultan Y, *et al.* Injection drug use is a risk factor for HCV infection in urban Egypt. *PLoS One* 2009;4:e7193.
  22. Vandelli C, Renzo F, Romanò L, Tisminetzky S, De Palma M, Stroffolini T, *et al.* Lack of evidence of sexual transmission of hepatitis C among monogamous couples: Results of a 10-year prospective follow-up study. *Am J Gastroenterol* 2004;99:855-9.
  23. Kao JH, Liu CJ, Chen W, Lai MY, Chen DS. Low incidence of hepatitis C virus transmission between spouses: A prospective study. *J Gastroenterol Hepatol* 2000;15:391-5.
  24. Terrault NA. Sexual activity as a risk factor for hepatitis C. *Hepatology* 2002; 36(5 Suppl 1): S99-105.
  25. Kaffashian A, Nokhodian Z, Kassaian N, Babak A, yaran M, Shoaie P, Ataei B, Adibi P. The experience of hepatitis C screening among prison inmates with drug injection history. *Journal of Isfahan Medical School* 2011;28:1571-5

Source of Support: Nil Conflict of Interest: None declared