

# Prevalence of Co-Infections of Hepatitis B and C Among Drug Abuse: Prisoners and Its Association With High Risk Behavior

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**Background:** One of the groups predisposed to viral coinfection of hepatitis B and C (HCV and HBV) is injecting drug prisoners. The crimes, they were sentenced to prison for, are often the same high risk behavior, which predispose individuals to high risk diseases like AIDS and hepatitis. Because coinfection of hepatitis B and C complicates the clinical course, management, and therapy, the literature on the prevalence of HBV/HCV coinfection among intravenous drug abuse inmates in Iran is sparse.

**Objectives:** This study aimed to investigate the prevalence of hepatitis B and C coinfection in drug abuse prisoners and its association with demographic characteristics and high risk behaviors.

**Patients and Methods:** This cross-sectional study was carried out on drug abuse prisoners during 2009 in Isfahan. Data were collected by questionnaire, including high risk behaviors, medical and surgery record, and demographic characteristics. Blood samples were tested for HBsAg and HCV Ab. Data were analyzed using descriptive statistics and Pearson test.

**Results:** The results showed that 20 inmates (2.1%) had coinfection of HBV and HCV. Also a significant correlation exists between coinfection of HBV and HCV and dental care ( $P=0.02$ ), using a shared needle ( $P=0.01$ ), and history of imprisonment ( $P=0.01$ ).

**Conclusions:** With regard to the results of the present research, in order to lower the risk of these diseases transmission in prison, some interventions are recommended as follows: informing the prisoners and enhancing their awareness about high risk behaviors, screening them prior to entry and during their stay, giving them sterile syringes, and supervising more carefully over entrance of drugs into the prison.

**Keywords:** Coinfection; Hepatitis B; Hepatitis C; Substance Abuse, Intravenous

## 1. Background

Viral hepatitis has been known as the most common cause of chronic hepatic diseases and cancer. WHO has announced cancer and cirrhosis of the liver, due to hepatitis, as the ninth cause for mortality in the world. Hepatitis B and C viruses are among the most important and dangerous types of viral hepatitis (1). Hepatitis B is one of the major problems in Iran and about 2%-7% of the Iranian population is involved in this disease. Based on WHO estimation, hepatitis B sickens over one million people each year (2). In Iran, 1.2 million people are involved in hepatitis B and C, but based on informal statistics, 2 million people are involved in hepatitis B and 200000 to 300000 in hepatitis C. On the other hand, 7.1% population country are carrier of hepatitis B and 1.3% of the country population are involved in hepatitis C (3). Hepatitis B (HBV) and C virus (HCV) infections are the most common causes of chronic liver disease worldwide. The outcome for patients with HBV, HCV coinfection is more severe compared to patients with a single viral infection (3, 4). Some studies carried out in

adults have demonstrated that the risk of progression to cirrhosis or cancer is high in patients with HBV, HCV coinfection (4). Mortality rate of coinfection of HCV in chronic hepatitis B patients may reach 10% (5). Therefore, screening hepatitis B infected patients for possible infection of HCV is very important. Roshandel (2007) in a study based on the population in Golestan showed that among 139 subjects, prevalence of HCV infection in HBsAg positive subjects was 12.3% (6). Adoga (2009) in a study about risk factors among prison inmates in Nasarawa State, Nigeria reported that of 300 prisoners, 54 (18.0%), 69 (23.0%), and 37 (12.3%) were tested positive for HIV, HBV, and HCV, respectively. Coinfections were eight (2.7%) for HIV/HBV and two (0.7%) for HBV/HCV (7). However, what makes coinfection of HCV and HBV more life threatening is their existence at high risk individuals. A group of people predisposed to this coinfection are the prisoners and drug abusers. Injecting drug and contaminated blood products are the major contamination ways for transmission of hepatitis B and C viruses

as well as AIDS (1). Imprisonment has also been reported as a risk factor for coinfection of hepatitis B and C in numerous studies (8). Hence, drug abuse prisoners are considered a high risk group who are more predisposed to these infections compared to common individuals in the community (1). In Azarkar's study (2007), 400 prisoners were surveyed and 0.25% were infected with both hepatitis B and C (1). Mohtasham (2006) in a study showed that there was a significant association between usage of shared laser blades and needle, having tattoos, marital status, addiction length, imprisonment length, and number of times being imprisoned as well as HCV infection (9). Researches show that prisons are crowded and stuffy environments in which low knowledge and poor culture of the prisoners and their disobedience from ethical and social issues are effective on capturing many diseases (10). Therefore, various researches have reported that high risk behaviors such as drug abuse inside or outside prisons put this population at risk of hepatitis B, C, and AIDS infections (11). Accordingly, as the crimes, for which the prisoners are sentenced to prison, are often the same as the risky behaviors predisposing individuals for life threatening diseases like AIDS and hepatitis (drug abuse, violence etc.), and besides prisoners are not totally confined and isolated from the community (because many prisoners are sentenced to short time imprisonment and can take temporary leaves to visit their families) they can act as a carrier for these two viruses and transmit the infection to the society (1). Moreover, based on the newest report of the United Nations Office on Drugs and Crime in Iran, our country is in the second rank concerning drug abuse prevalence and there are 3.7 million addicts of whom 1.2 million are permanent drug addicts and 2.5 million are recreational drug users, and about 8% is added to this number annually (12). Because estimation of the prevalence and incidence of drug abuse and dependency to psychotropic materials, especially injecting drugs as well as sexual high risk behaviors is difficult through direct methods, evaluation of these parameters in specific groups can yield an appropriate estimation of this problem in the level of society (13). With regard to high risk of developing hepatitis infection among prisoners, especially those in sections of drug abuse, it is essential to screen the sick and addicted prisoners at their entrance to give them necessary educations and treatment to avoid vast contamination of the infection among the other prisoners and its transmission outside prison. Therefore, considering the limited data on the epidemiology of HCV infection and related risk behaviors in prison (14), in this study we have focused on this infection and transmission risk factors among prisoners with history of IDU that could potentially be incorporated into current and future harm reduction initiatives in prisons.

## 2. Objectives

This study aimed to investigate the prevalence of coin-

fection of hepatitis B and C in drug abuse prisoners and its association with some personal and medical characteristics as well as high risk behaviors to provide health care for the prisoners, their families and the society.

## 3. Patients and Methods

This is a cross-sectional study. All 1000 male prisoners, who involved in drug abuse were enrolled by census method in central prison and Asadabad camp in Isfahan in 2011. After completion of the informed consent forms and questionnaires, 970 subjects were admitted voluntarily into the research. The inclusion criteria were prisoners with history of drug abuse who filled out written informed consent form. Personal characteristics, medical, surgery and history of high risk behaviors were collected by questionnaire, including (age, education, marital status), medical and surgery record (emergency and nonemergency surgeries such as having sutures, blood transfusion, medial injections out of hospitals, history of dental care), history of high risk behaviors (tattooing, sex [other than his wife], cupping, injection drug abuse, usage of a shared needle, and imprisonment history). Face and content validities of the questionnaires were confirmed by 10 academic experts, and its reliability was calculated by Cronbach  $\alpha$  ( $r = 0.78$ ). HBc Ab test had also sensitivity of 99.7% and specificity of 100%, HCV Ab test had sensitivity and specificity of 98%, and HBsAg test had sensitivity and specificity of 97.5% (14). With regard to the method of the study, at first 1000 injecting drug abusers were selected through census sampling in the research environment. Then, the purpose and method of the study were explained to them during an orientation session and the consent forms and the questionnaires were distributed among them. Since health center of the prison was not appropriate to fill out the questionnaire, the subjects were interviewed by closed questions face to face in prison wards by educated staff. After reviewing the questionnaires, 30 subjects were left out of the study either due to incomplete answering of the questionnaire or not signing the consent form. Finally, 970 subjects were enrolled in the study. Then 5 mL blood sample was taken from each subject (prisoners) by a trained and blood sampling group under safety instruction. The blood samples were transferred to Isfahan Infectious and Tropical Diseases Research Center, coded and kept in a -10 °C freezer through Aliquot method until completed in number. The blood samples were tested for HBsAg and HCV Ab by commercial enzyme linked immunosorbent assays (ELISA) method using Diapro kit (made in Italy). Next, positive and negative cases were defined based on kit instructions. Ethical considerations such as subject's identification and personal information confidentiality have been followed, and the subjects attended the research after filling out written informed consent form. The present study has also been approved by Ethics Committee of Research Vice-chancellery of Isfahan University of Medical Sciences.

Statistical analysis was performed through Student t-test, 1-way analysis of variance (ANOVA), Mann-Whitney, Chi-square, correlation coefficient, and linear regression model using SPSS statistical software (version 11.5). Additionally, to describe the characteristics of descriptive research statistics, including mean  $\pm$  SD, and frequency distribution; and to investigate the research aims, Pearson and Spearman correlation tests as well as general linear regression model have been used. The significant level was considered less than 0.05. In this study, the tests and their designers were kept anonymous, and the participants signed informed consent forms and were assured about confidentiality of their personal information. Also, researchers began sampling and performing the research after the approval of the research from University Research Ethics Committee and after obtaining a letter of recommendation from Faculty of Nursing and Midwifery of Isfahan and submitting it to prison.

#### 4. Results

In this study, 970 serum samples of the male prisoners were tested for HBsAg and HCV Ab. With regard to the personal characteristics, medical records, and high risk behaviors of the subjects, the finding showed that their mean age was  $32.62 \pm 8.19$  years. Twenty-three subjects (2.4%) were illiterate, 236 subjects (24.3%) had primary school education, 68 subjects (7%) had a high school diploma, 15 subjects (1.65%) had an associate degree or Bachelor's degree, 31 subjects (3.2%) had high school education, and six subjects (0.6%) were just literate. A total of 237 subjects (25.5%) had a HCV positive member in their relatives, 521 subjects (53.7%) got married, 470 (48.5%) subjects had surgery and 733 (75.6%) had sutures (Table 1). Another finding showed that 32 (3.3%) were HBsAg<sup>+</sup> and 188 (19.4%) HBc Ab<sup>+</sup>. The obtained results also showed that out of 970 male prisoners, who involved in drug abuse, 20 subjects (2.1%) had coinfection of HBV and HCV. Bivariate association between demographic characteristics, medical feature, potential risk factors, and HBsAg, HCV Ab seropositivity are shown in Table 2.

Pearson test showed no significant association between coinfection of HBV, HCV and age, marital status, education level, having tattoos, cupping, having sutures, blood transfusion, medical injections out of hospitals, dental care, and having sex (other than his wife). The results showed that there was a significant association between coinfection of HBV, HCV and dental care ( $P = 0.02$ ), using a shared needle ( $P = 0.01$ ) and history of imprisonment ( $P = 0.01$ ), but multiple logistic regression just showed a significant association with using a shared needle for coinfection (0.001).

#### 5. Discussion

The present study investigated positive cases of coinfection of hepatitis B and C and the related risk factors among prisoners. The results showed that some pris-

oners had coinfection of HBV and HCV (2.1%). Azarkar (2006), quoting from Khamisipour, states that in a study (2002) on injecting drug prisoners in Mashhad, 60% and 3% of the subjects were involved in hepatitis C and B, respectively (1). Sabbatani (2004) in a study on prisoners reported their involvement in hepatitis B and C as follows: 12.5% of inmates were HIV positive, 8.1% HBV positive and 31.1% HCV positive. Twenty-five subjects were found positive both for HIV and HCV; 1 both HIV and HBV, and 5 for HIV, HBV, and HCV (15). Macalino (2004) showed incidence level of hepatitis B and C was 20.2% and 23.1%, respectively (16). De La Hoya et al.

**Table 1.** Distribution of Prisoner's Personal Characteristics, Medical/Surgical History and High Risk Behaviors

Variables	No. (%)
<b>Blood transfusion</b>	
Yes	189 (19.5)
No	745 (76.8)
No response	36 (3.7)
<b>Medical injection out of hospital</b>	
Yes	419 (43.2)
No	510 (52.6)
No response	41 (4.2)
<b>Dental care</b>	
Yes	605 (62.4)
No	334 (34.4)
No response	31 (3.2)
<b>Tattoos</b>	
Yes	564 (58.1)
No	373 (38.5)
No response	33 (3.4)
<b>Sex (other than his wife)</b>	
Yes	265 (27.3)
No	675 (69.6)
No response	30 (3.1)
<b>Shared needle</b>	
Yes	352 (36.3)
No	586 (6.4)
No response	31 (3.1)
<b>Imprisonment history</b>	
Yes	671 (69.2)
No	268 (27.6)
No response	51 (5.3)
<b>Drug injection</b>	
Yes	725 (74.7)
No	218 (22.5)
No response	27 (2.8)

**Table 2.** Bivariate Association Between Medical Feature, Potential Risk Factors and, HBsAg, HCV Ab Seropositivity<sup>a</sup>

Variable	HBsAg+		Coinfection		HCV Ab+	
	No. (%)	P Value	No. (%)	P Value	No. (%)	P Value
<b>History of tattooing</b>		0.01		0.90		0.004
Yes	564 (60.2)		19 (3.4)		76 (13.5)	
No	373 (39.8)		12 (3.2)		51 (13.7)	
<b>History of cupping</b>		0.60		0.64		0.50
Yes	366 (39.3)		13 (3.6)		46 (12.6)	
No	566 (60.7)		17 (3)		80 (14.1)	
<b>History of surgery</b>		0.86		0.38		0.96
Yes	470 (50.6)		17 (3.6)		64 (13.6)	
No	459 (49.4)		12 (2.6)		62 (13.5)	
<b>History of Suture</b>		1		0.61		0.24
Yes	733 (78.9)		24 (3.3)		102 (13.9)	
No	196 (21.1)		5 (2.6)		21 (10.7)	
<b>History of blood Transfusion</b>		0.10		0.04		0.55
Yes	189 (20.2)		10 (5.3)		28 (14.8)	
No	745 (79.8)		20 (2.7)		98 (13.2)	
<b>History of medical injection out of hospital</b>		0.66		0.46		0.51
Yes	419 (45.1)		16 (3.8)		53 (12.6)	
No	510 (54.9)		15 (2.9)		72 (14.1)	
<b>History of dental work</b>		0.02		0.06		0.10
Yes	605 (64.4)		25 (4.1)		90 (14.9)	
No	334 (35.6)		6 (1.8)		37 (11.1)	
<b>Having sex (other than his wife)</b>		0.62		0.76		0.001 a
Yes	675 (71.8)		23 (3.4)		96 (14.2)	
No	265 (28.2)		8 (3)		31 (11.7)	
<b>History of drug injection</b>		0.59		0.17		0.45
Yes	725 (76.9)		27 (3.7)		101 (13.9)	
No	218 (23.1)		4 (1.8)		26 (11.9)	
<b>History of sharing needle</b>		0.01		0.04		0.29
Yes	352 (37.5)		17 (4.8)		53 (15.1)	
No	586 (62.5)		14 (2.4)		74 (12.6)	
<b>History of previous imprisonment</b>		0.02		0.25		< 0.00
Yes	671 (71.5)		25 (3.7)		110 (16.4)	
No	268 (28.5)		6 (2.2)		17 (6.3)	
<b>Marital status</b>		0.38		0.23		0.006
Married	13 (2.5)		23 (4.4)		73 (14)	
Single	7 (1.7)		8 (1.9)		53 (12.6)	
<b>Total duration of incarceration, Mean ± SD</b>	5.06 ± 4.65	0.54	5.06 ± 4.65	0.79	6.62 ± 5.41	0.002
<b>Age, Mean ± SD, y</b>	32.05 ± 6.39	0.76	34.84 ± 8.66	0.60	33.84 ± 8.66	0.11

<sup>a</sup> Data are presented as No. (%) or mean ± SD.

(2011) in a study on prisoners reported prevalence of coinfection of hepatitis B and C as 3% (17), which is consistent with the findings of the present study. The difference in the degree of hepatitis B and C virus infections and their

coincidence in various studies are possibly due to different levels of infection in the whole population, type of prisons and prisoners, their health condition, and involvement in high risk behaviors, which vary in different

societies with various cultures. However, a prison is one of the limited crowded places concerning physical atmosphere where prisoners' low knowledge and cultural principles are effective on spreading numerous diseases (13).

The results showed a significant association between coinfection of HBV and HCV and dental care. Hepatitis B and C viruses are known as the most important pathogen viruses, which can be transmitted via dental tools (18). Savabi (2011) in a study showed that 40.39% of the dentists never wore a gown, and 20.3% never changed the cover of their dental unit. Meanwhile, over 90% of them wore gloves and changed them, and 94.5% of them recapped the used needle (19). The injuries caused by sharp tools, needles stick, tools, and direct contact of blood and saliva with skin cuts in bare hands or gloves with holes in them, spray of blood and saliva on open skin injuries or mucous are among major occupational risks of the dentists (20). Dental procedures, which invade the skin and mucosal barriers, could transmit the pathogens. Two very important diseases, which are transmitted through this mechanism, are hepatitis B and AIDS (19). Since dentists' practice and professional behavior plays an important role in their health promotion and community, educational courses to address fear of dentists and guiding them about AIDS and HBV are recommended.

The findings also showed a significant association between coinfection of HBV and HCV and usage of a shared needle. In this regard, based on conducted researches, frequency of HBsAg and hepatitis C were reported as 5.8% and 7.8%, respectively (1). Roshandel (2008) showed that 36.3% of the prisoners had been imprisoned for drug related crimes. There was a significant association between prevalence of hepatitis C and having tattoos (18.9%), addiction to drugs (16.6%), and history of surgeries (16.1%) ( $P < 0.001$ ). Although this issue reveals that injecting drug users are more involved in high risk behaviors compared to other groups, and with regard to the fact that one of the important transmission ways of hepatitis B and C is shared syringes and needles, the high level of this infection is clearly expected in the society (6).

Result of a research shows that the risk factors related to drug injection, the length of drug injection addiction, the type of injected substance and needle sharing are directly or indirectly associated with the spread of hepatitis B and C (21). In Imani's study, needle sharing has been defined as an important factor for the incidence of the infections (22). In a study in Germany, in addition to education and increase of individuals' awareness, sterile injection tools were distributed among the prisoners and a reduction was observed not only in the percentage of injected drugs, but also in sharing needles, and consequently, transmission of hepatitis B and C and HIV (23). A prison is a place in which injection tools are not conveniently available; therefore, the prisoners have to share needles, which helps spread the viruses among them (24). So it is important to execute primary prevention in

prisons through syringe/needle exchange and counsel with imprisoned intravenous drug using. Results of the present study showed a significant association between imprisonment and coinfection of hepatitis B and C. Sabbatani (2004) in a study on the prisoners reported that 12.5% of the subjects were involved in HIV, 8.1% in hepatitis B and 31.1% in hepatitis C (15). The results of the present study and other researchers report high risk behaviors like drug abuse inside or outside the prisoners, which predispose the prisoners to infections of hepatitis B, C, and AIDS (25, 26). Azizi (2011) believes that preventive interventions, performing the harm reduction and preventing programs in prisons and obligation of raising awareness in high-risk groups are compelling now for IDUs to ensure their safe passage through incarceration (27).

On the other hand, prisoners are not confined and isolated from the community. Many of the prisoners are imprisoned for a short time, go on temporary leaves to visit their families or are released and contact outside community and their families. Addicted prisoners are not only in danger of contamination with life threatening diseases like AIDS and hepatitis, but also they can transmit these infections to the society. Therefore, more investigation on common high risk behaviors and appropriate strategies to control them seems essential (24). With regard to the results of the present study and formal statistics in Iran, about 200000 injecting drug users live in Iran (28) now, and one of the outcomes of drug abuse is involvement in the diseases transmitted by blood (29). Most of the studies have shown injecting addiction as the most important risk factor concerning infections of hepatitis B and C, and long and frequent imprisonments as well as high risk behaviors such as drug injection (30). Thus, the related authorities should pay more attention toward precise and constant preventive programs to lower the burden, and the last but not the least, more empowerment of health and treatment centers in prisoners is highly recommended. Because prisons are potential locations for committing high risk behaviors, efficient counseling sessions conducted by skilled experts seem essential (31).

Present study had some limitations. First, it included a low number of cases of HBV and HCV coinfection. Second, cases of HBV and HCV coinfection (subjects) were not compared with non-drug abusers, thus it is difficult to make a clear statement about the risk factors related to coinfection of HBV and HCV. Since, AIDS and hepatitis are the most important diseases among prisoners, in order to lower the risk of contracting these diseases in prison, we recommend some interventions such as informing the prisoners and enhancing their level of knowledge about high risk behaviors, screening them prior to being granted entry and during their stay, giving them sterile syringes, careful supervising over entrance of drugs into the prison, and prevention of group use of drugs and sharing needles to lower the risk of disease transmission.

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