



## Prevalence of HIV and Hepatitis B, C, D Infections and Their Associated Risk Factors among Prisoners in Southern Khorasan Province, Iran

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### Abstract

**Background:** Prison inmates are among the high risk population for dangerous infections such as HIV, HBV, HCV and other contagious diseases. In spite of many data about the prevalence and risk factors for blood born diseases among prisoners in the world, such data are sparse from Iran. The aim of this study was to determine the prevalence and associated risk factors for HIV, HBV, HCV and HDV infections among a large sample of prison inmates in Iran.

**Methods:** In a cross-sectional study in 2009-2010, 881 inmates in three prisons of Southern Khorasan Province in Iran were selected based on a systematic, stratified random sampling method. Sera were analyzed for HBV, HDV, HCV and HIV infections by appropriate commercial ELISA kits. An anonymous questionnaire was used to collect the demographic data and information about risk factors.

**Results:** Overall, 881 prisoners (mean age:  $34.7 \pm 11.4$  years, range: 11-84 years, M/F ratio: 4.5/1) were participated in this study. The prevalence of HBV and HCV infection was 6.9% and 7.7%, respectively. Among the HBsAg positive subjects, 6.6% (4/61) and 9.8% (6/61) had HDV and HCV super-infection, respectively. Only one case (0.1%) had HIV infection that was co-infection with HCV. Drug abuse and history of traditional phlebotomy were associated risk factors for HBV infection ( $P < 0.05$ ) and history of drug injection was associated with HCV infection ( $P < 0.05$ ).

**Conclusions:** This study shows fairly higher prevalence of blood borne infections among prisoners and indicates drug abuse and phlebotomy as the associated risk factor. Implementation of appropriate screening tests and preventive programs is suggested in prisons.

**Keywords:** Hepatitis B, Hepatitis C, HIV, Injecting drug users, Prison

### Introduction

Prison inmates are a high risk population for dangerous infections such as human immunodeficiency virus (HIV), hepatitis B and C viruses (HBV, HCV) as well as other blood born diseases (1-7). Up to 40% of all Americans with chronic viral hepatitis were in prison and the prevalence of

viral hepatitis among prisoners was significantly higher than general population (8). In fact these infections have been transmitted to prisoners while they were in prison (9-11) and it could be explained by higher prevalence of risky behaviors among this population which include, but are not

limited to, drug abuse, frequent injections, needle sharing, promiscuity and unprotected sex as well as tattooing. Early identification and treatment of infected prisoners can decrease the risk of infection transmission not only inside prisons but also after community re-entry.

Data about the prevalence and risk factors for blood born infections in prisoners are very scarce in Iran. A few studies have reported HCV infection in 30-45% of Iranian drug abuser prisoners (12-14) and in one study, the prevalence of HBV infection was 4.7% among Iranian prisoners which is quite higher than normal population (15). This higher prevalence in inmates of different regional central prisons compared to the general population in Iran emphasizes the need for aggressive intervention for identification and treatment of patients and implementation of preventive strategies.

To our knowledge, data about the risk factors associated with higher prevalence of HIV, HBV, and HCV infections among prison inmates in Iran are scarce and thus judgment about blood-borne infections within the prisons often was made based on data from other countries while socio-economical and cultural situations are somehow different in Iran and therefore study about the rate, sources and associated risk factors for blood borne diseases in prisons is a key factor for prevention and control of spreading of the infections within the prisons which leads to decrease the rate of transmission not only in prisons but also in the whole community.

The aim of this study was to determine the prevalence and associated risk factors for HIV, HBV, HDV and HCV infections among a sample of prison inmates in three central prisons in Southern Khorasan Province, Iran.

## Methods

This cross-sectional study was carried out on prisoners over a period of one year (March 2009–February 2010) in three prisons (2 in Birjand City and 1 in Qaem City) in Southern Khorasan Province, Iran. The study protocol was performed in accordance with the declaration of Hel-

sinki and subsequent revisions and approved by ethics committee of Birjand University of Medical Sciences and by Southern Khorasan Bureau of Prisons as well.

Participation in the study was voluntary and confidentiality of information was guaranteed. Informed consent was obtained from each prisoner who participates in this study. Sample size was calculated as 838 cases and based on a systematic, stratified random sampling, 900 prisoners were invited for this study and finally 881 prisoners enrolled in the study and demographic data as well as information about risk factors were collected by an anonymous questionnaire which completed by a trained assistant through interview with prisoners. Five ml of venous blood was drawn from all participants and sera were screened for anti-HCV antibody (Dia-pro diagnostic® HCV EIISA, Italy), hepatitis B surface antigen (Dia lab® HBs Ag, Austria), anti HIV antibody (Dia lab® HIV Ab, Austria) in duplicate. All sera positive for HCV-Ab and HIV-Ab were confirmed by the second generation of recombinant immunoblot assay (RIBA) kits (Diagnostics® HCV blot; Germany) and western blot as a complementary test respectively.

## Statistical analysis

The data were analyzed by SPSS software version 18 (SPSS Inc., Chicago, IL, USA) and chi-square and if necessary Fisher exact test were used to compare the variables. A *P* values < 0.05 was considered as statistically significant.

## Results

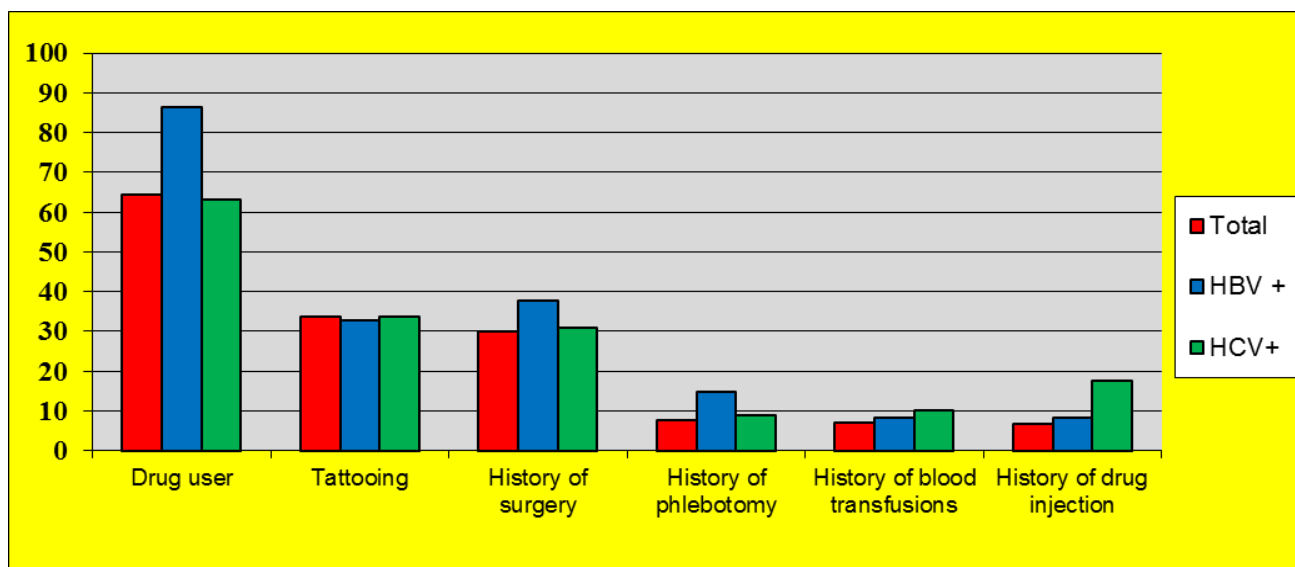
Among the 881 participants, 723 were male (82.1%) and 158 (17.9%) were female. The mean age of study population was  $34.7 \pm 11.4$  (range 11-84) years. Out of 881 prisoners, 61 cases (6.9%) were positive for HBsAg and 68 cases (7.7%) were positive for anti-HCV. Among subjects who were HBsAg positive, 4 cases (6.6%) were HDV positive as well. Co-infection of HBV and HCV was found in 6 (0.7%) subjects. One case was positive for HIV infection (0.1%) which also had co-infection with HCV.

Although for both HBV and HCV, the rate of infection was higher in male than female (7.6% and 3.8%, for HBV 8% and 6.3%, for HCV respectively) but the difference was not significant. 568 cases (64.5%) had a history of drug abuse and 57% (324 cases) had history of opium consump-

tion. Table 1 shows type of drug and route of administration among the participants. Among HBsAg and HCV positive cases, 5 (8.2%) and 12 (17.6%) cases were injecting drug users (IDUs) respectively. Figure 1 shows the occurrences of different risk factors among prisoners.

**Table 1:** Type and route of drug administration among prisoners

	Number	Percent
<b>Total substance users</b>	568	64.5
<b>Type of substance</b>		
Opium	324	57
Heroin	27	4.7
Crystal methamphetamine	40	7
Multi-drug use	177	31.3
<b>Route of administration</b>		
Smoking	435	76.6
Injection	25	4.4
Oral	21	3.7
Combine injection and other ways	34	6.1
Combine smoking and other ways	53	9.2



**Fig. 1:** Prevalence of different risk factors among HBV and HCV positive subjects

Statistical analysis showed that the prevalence of HBsAg was significantly higher among drug users (9.3 vs. 2.6%,  $P<0.001$ ) or those who had a history of traditional phlebotomy (cupping) (13.2 vs. 6.4%,  $P=0.03$ ) (Table 2) but there was no significant difference in the rate of HBV infection regarding history of drug injection (8.5% vs. 9.4%,  $P=0.81$ ). The rate of HCV was significantly higher among prisoners with a history of drug injection (20.3 vs. 6.1%,  $P<0.001$ ) (Table 3). There was no significant correlation between HBsAg or HCV infection and history of surgery, tattooing or receiving blood transfusions

**Table 2:** Analysis of potential risk factors for HBV infection among prisoners

Risk factor	HBsAg +	HBsAg-	P-value
Drug user	53 (9.3)	8 (2.6)	<0.001
Tattooing	20 (6.7)	41 (7)	0.86
History of surgery	23 (8.7)	38 (6.2)	0.17
History of traditional phlebotomy	9 (13.2)	52 (6.4)	<b>0.03</b>
History of blood transfusions	5 (8.1)	56 (6.8)	0.6
History of drug injection	5 (8.5)	48 (9.4)	0.81

**Table 3:** Analysis of potential risk factors for HCV infection among prisoners

Risk factor	Anti-HCV +	Anti-HCV -	P-value
Drug user	43 (7.6)	25 (8)	0.82
Tattooing	23 (7.7)	45 (7.7)	1
History of surgery	21 (8)	47 (7.6)	0.86
History of traditional phlebotomy	6 (8.8)	62 (7.6)	0.72
History of blood transfusions	7 (11.3)	61 (7.4)	0.27
History of drug injection	12 (20.3)	31 (6.1)	<0.001

## Discussion

Prisoners are a high risk population for blood born diseases and regular assessment of prisoner's health and identification of infected cases and related risk factors has a very important role in prevention and reducing the risk of transmission inside and outside prisons. In the present study the rate of HCV, HBV, HDV and HIV infections in three central prisons of Southern Khorasan was quite higher than general population. In another study on prisoners in our region (Birjand) also report similar results in which the HBV and HCV prevalence was 6.1% and 8.1%, respectively with no HIV positive case (16).

In comparison to other parts of Iran, the rate of HCV infection in our study (8% in all, 9.3% in drug users, and 8.5% in IDUs) was lower. A study in west of Iran (Hamedan) indicated that 30% of all drug using prisoners and 31.5% of IDUs had HCV infection (12). Rate of HCV infection in drug using prisoners was reported around 30.8 and 45.4 in Gilan and Mazandaran provinces respectively (13,14) and HCV was high as 88.9% in IDUs prisoners in Gilan study. The rates of all blood-borne infections were dramatically high among prisoners in south of Iran. HIV, HCV and HBV infection rate among IDU inmates in Hor-

mozgan Province (in Northern margin of Persian Gulf) was found to be 15.1%, 64.8%, and 4.7%, respectively (15). In other countries, studies on prisoners reported a variety of results. In Pakistan, which is relatively near to our study location, the rate of HCV among prisoners was 12.8% (17). A study in Europe (Croatia), had similar rates to our result for overall infections (HBV 11.3%, HCV 8.3%, HBV/HCV 6.3%), but higher rates among IDUs (52% HCV and 26.2% HBV) (18). Another study in prison of Australia showed that the incidence rate for HCV infection among IDUs was 34.2% per 100 person years (19). Although the results are different and it could be explained by differences in the prevalence of infection in communities and some socio-economical and cultural factors but all studies indicated that the rate of HCV infection in IDUs is higher than non-IDUs prisoners. Our study showed that HBV infection was significantly associated with drug abuse and traditional phlebotomy which is a therapeutic method used in traditional medicine and still is popular in many societies including Iran. It can be a risky behavior especially considering that mostly the hygienic criteria is not met during phlebotomy. The association of HBV seropositivity with phlebotomy was reported in other parts of Iran as well (20).

The rate of blood born diseases was lower in female and it could be explained by lower rate of crimes, drug abuse and other risky behaviors among female which is related to cultural and religious believes. As far as we know, there is no data about the rate of HDV among prisoners but in several studies on general population in Shiraz, Golestan and Tabriz the rate of HDV infection among Hepatitis B patients was 13.9%, 5.8% and 6.15% respectively (21-23) with is close to our result.

In spit of higher prevalence of blood born diseases among prisoners than general population, still the prevalence of HBV, HCV and especially HIV was lower than other reports from Iran and other countries as well. Iran is a large country and people in different parts have different ethnicities, culture and lifestyles. South Khorasan is located in Mid-East of Iran with a fairly high level of education and general health and low rate of crimes for example there are just two known cases of HIV infection in the whole province (unpublished date). In the same context, prevalence of hepatitis B among blood donors was reported around 0.8% (24) while the prevalence in our province is around 0.47%, therefore the lower rate of infections among prisoners can be a result of some factors including low prevalence of these diseases among general population, good level of education, traditional lifestyle and low density of prisoners in prison.

## Conclusions

With consideration of higher prevalence of blood born infection among prisoners, it is necessary to effectively apply practical approaches to reduce risk of transmission for these infections in prisons such as vaccination, education of prisoners and prison staffs about blood-borne infections and transmission risk factors especially sharing needles and syringes and phlebotomy.

## Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or fal-

sification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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