

## Reduction in Prevalence of Hepatitis B Surface Antigen Among Intravenous Drug Users in Tehran Drop-in-Centers

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**Background:** Despite the availability of an effective vaccine for more than three decades, HBV (hepatitis B virus) continues to infect many people worldwide, particularly in developing countries of Asia. In older people at higher risk of infection, high prevalence of HBV may exist, particularly among intravenous drug users (IDUs). This group is among groups at higher risk of infection as they share needles for drug injection.

**Objectives:** The current study aimed to determine the prevalence of HBsAg (hepatitis B antigen) among intravenous drug users in drop-in-centers (DICs) of Tehran in 2013.

**Patients and Methods:** This cross-sectional study included 129 intravenous drug users recruited from DICs in Tehran in 2013. Socio-demographic characteristics and associated risk factors were recorded during the sample collection. Their serum samples were tested for the presence of HBsAg by enzyme-linked immunosorbent assay (ELISA).

**Results:** HBsAg was detected in 4 of 129 subjects, giving an overall prevalence of 3.1%. No significant correlation was observed between HBsAg positivity and socio-demographic and associated risk factors.

**Conclusions:** Undoubtedly, IDUs are one of the most high-risk groups exposed to infection; so the priority of preventive and educational programs would be beneficial for this high-risk group. Screening IDUs at the national level and statistical analysis for HBV in the larger sample size is recommended.

**Keywords:** Hepatitis B virus; Harm Reduction; Iran; Behavior, Addictive

### 1. Background

Intravenous drug users (IDUs) are at increased risk for acquiring blood-borne infectious diseases, particularly hepatitis B virus (HBV) (1). Hazardous behaviors of these addicts such as sharing syringes, using the same syringe several times, or using infected syringes are the main routes for infection with human immunodeficiency virus (HIV), hepatitis B, C and various lung and cerebral abscesses. Infection with these types of diseases at family and society levels can be the result of sexual hazardous behaviors of this infected group (2). To the best of our knowledge, up to 90% of IDUs suffer from one of the viral diseases. There is a direct relationship between the number of cases infected by these viruses and duration of injection drug usage (3). Long duration of drug injection may lead to more sharing of needles and other

instruments, resulting in a greater likelihood of transmission (4).

Other studies demonstrated that long-term imprisonment, with drug injection behavior is independently associated with HBV infection (5, 6). Incorporation of routine HBV screening, vaccination, long-term treatment, improved jail health system, detoxification clinics and harm reduction programs like DICs, are among important steps to reduce further transmission and the future burden of blood-borne diseases (7). Iran has one of the highest per capita number of opioid users in the world, with a substantial and potentially growing population of IDUs (8). According to a report by the Iranian welfare organization, among 1.8 million drug users in Iran, 9% to 16% are IDUs, while half of them share needles. It could

#### Implication for health policy/practice/research/medical education:

This study aimed to expand harm reduction services among intravenous drug users to reduce hepatitis B prevalence in this high-risk group.

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be estimated that the IDU population in Iran ranges between 200000 and 300000 IDUs. As the number of IDUs is increasing in Iran, there could be potential danger for the national health system (9).

Injection drug usage has been the most major route of drug abuse in Iran during the past decade (3). In this regard, the high rates of HCV and HBV infection among IDUs have been reported in Iran (10-12). The reports showed controversial results about the association between injecting drug behavior and the high rate of HBV & HCV (13-16). In 2002, a harm reduction policy was adopted in Iran; expansion of harm reduction policy started after the design of the national five-year program (2002-2007). Around 1400000 needles and syringes were distributed to IDUs through 120 DICs, over a six-month period in 2007 (17). Another program was opioid substitution treatment among 22000 drug users in mid-2007 (17). Educational programs on hepatitis B risk factors, increasing easy and affordable access to HBV-testing and free vaccination for IDUs are important to reduce the prevalence of HBV infection in this group (18).

## 2. Objectives

This study examined the characteristics, risk behaviors and risk factors of HBV infection among IDUs in Tehran. The results of this study were associated with the prevalence of HBsAg and the correlating factors in this group, and services provided for IDUs in DICs such as needle and syringe program (NSP) in Tehran.

## 3. Patients and Methods

### 3.1. Sample Selection and Study Population

A cross-sectional study was performed on 129 volunteers (128 males and 1 female), current IDUs selected from three DICs located in different well-known areas with high rates of drug-related risk behaviors between April and June 2013 in Tehran. Face-to-face interviews were done using questionnaires that elicited personal data containing demographic data such as age, gender, employment status, marital status, history and duration of addiction, history of imprisonment, kind and route of drug use, hepatitis B vaccination, and some high-risk behaviors like sharing syringes, sexual behaviors and tattooing. Five milliliter peripheral blood was taken from each individual and transported to the laboratory for storage. IDUs were able to receive the results of their tests based on their own code number.

### 3.2. Detection of Serology Markers

Sera were collected and stored in aliquots at -20 °C for further testing. The samples were examined using

enzyme-linked immunosorbent assay (ELISA) to detect HBsAg. HBsAg was checked using highly specific enzyme immune assays (DIA. Pro, ITALY, specificity > 99%). All positive samples for HBsAg were tested twice using the same method to confirm the results.

### 3.3. Statistical Analysis

Data were extracted from questionnaires, and summarized. The standard Chi-square test was used to assess the correlation of demographic and behavioral variables and HBsAg positivity. All analyses were performed using SPSS for windows (version 19: SPSS Inc, USA). Results were regarded as significant when  $P < 0.05$ .

## 4. Results

A total of 129 IDUs participated in this study; note that some of them were DIC workers who had a history of injection drug usage. Regarding the age of the participants, 17.1% of subjects were between 20-30 years old, 34.1% were between 30-40, 29.5% were between 40-50 and the rest were above 50 years old (Table 1).

Socio-demographic profiles of participants with regard to the number of subjects, who answered each question, are presented in Table 1. Among the 129 cases in this study the prevalence of HBsAg was 3.1%. No statistically significant association was observed between HBsAg positivity and sharing needle equipment, duration of drug use, history of imprisonment, frequency of injection per day, type of drug, tattooing, history of surgery and high risk sexual behaviors,  $P > 0.05$  (Table 2). The highest rate of HBsAg positivity was among cases with more than 10 years duration of drug usage, and history of imprisonment (Table 3).

Due to the low number of female cases, the statistical analysis of data between different sexes was ignored. Results showed that immunization strategies in DICs targeting IDUs have been instrumental in reducing overall prevalence of HBsAg. Continuous surveillance and repeated studies are needed to monitor trends, and effects of large scale harm reduction intervention.

## 5. Discussion

In this study, of 129 IDUs, four subjects were HBsAg positive (3.1%). In Khodadadizade et al. (2005), of 180 subjects five were HBV infected from whom three subjects were IDUs (19). In Nikkhooy et al. study in Ahvaz, South-west of Iran conducted in 2004, 1.5% of 258 IDUs who were hospitalized in Razi Hospital were positive for HBsAg (20). In another study, 970 IDU male prisoners were examined by Daneshmand et al. in 2009 in Esfahan, central Iran, and 32 subjects (3.3%) were positive for HBsAg. Daneshmand et al. study concluded that the longer duration of being incarcerated is associated with higher prevalence of HBV infection (18). In another descriptive analytical study on 133 IDUs, 8 (6.2%) were HBV positive cases; a strong correlation

**Table 1.** Socio-demographic Characteristics of IDUs in Tehran 2013

Characteristics	Frequency	Intravenous drug users, %
<b>Age, n<sup>a</sup> = 129</b>		
20 - 30	22	17.3
30 - 40	44	34.6
40 - 50	38	29.9
> 50	23	18.1
<b>Employment status, n = 129</b>		
Unemployed	96	74.4
Employed	33	25.6
<b>Marital status, n = 126</b>		
Married and living with a partner	94	74.6
Single or separated	32	25.4
<b>Duration of drug usage, n = 125</b>		
< 1, y	2	1.6
1 - 5, y	19	15.2
5 - 10, y	26	20.8
> 10, y	78	62.4
<b>History of imprisonment, n = 123</b>		
	84	68.3
<b>Frequency of injection in a day, n = 70</b>		
1 - 3	41	58.6
3 - 6	21	30.0
> 6	8	11.4
<b>History of sharing needle equipment, n = 64</b>		
	16	25
<b>Type of drug, n = 126</b>		
Heroin	31	24.6
Other <sup>b</sup>	44	34.9
Heroin + other	51	40.5
<b>History of tattooing, n = 121</b>		
	47	38.8
<b>History of blood transfusion, n = 57</b>		
	17	29.8
<b>History of surgery, n = 117</b>		
	51	23.6
<b>History of sexual behavior, n = 74</b>		
	34	35.9
<b>History of dentistry, n = 87</b>		
	69	79.3
<b>HBV vaccination, n = 98</b>		
	57	8.25

<sup>a</sup> Number of injection of drug users who answered each question, n = 129.

<sup>b</sup> Other drugs including opium, crack, crystal, etc.

**Table 2.** Risk Factors Associated With HBV Infection in IDUs

Risk Factor	HBsAg Positive, No. (%)	HBsAg Negative, No. (%)	Total	P value
<b>Sharing syringe</b>				
Yes	0 (0)	16	16	> 0.05
No	2 (4.1)	46	48	> 0.05
<b>Duration of drug use, y</b>				
<1	0 (0)	2	2	> 0.05
1-5	1 (5.2)	18	19	> 0.05
5-10	0 (0)	26	26	> 0.05
>10	3 (3.8)	75	78	> 0.05
<b>History of imprisonment</b>				
Yes	3 (3.5)	81	84	> 0.05
No	1 (2.5)	38	39	> 0.05
<b>Frequency of injection</b>				
1-3	3 (7.3)	38	41	> 0.05
3-6	0 (0)	21	21	> 0.05
>6	0 (0)	8	8	> 0.05
<b>Type of drug</b>				
Heroin	2 (6.4)	29	31	> 0.05
Other <sup>a</sup>	1 (2.2)	43	44	> 0.05
Heroin + other	1 (1.9)	50	51	> 0.05
<b>Tattoo</b>				
Yes	2 (4.2)	45	47	> 0.05
No	2 (2.7)	71	73	> 0.05
<b>History of surgery</b>				
Yes	1 (1.9)	50	51	> 0.05
No	3 (4.5)	63	66	> 0.05
<b>High risk sexual behaviors</b>				
Yes	1 (2.9)	33	34	> 0.05
No	2 (5)	38	40	> 0.05

<sup>a</sup> Other drugs such as opium, crack, crystal, etc.

**Table 3.** Statues of HBsAg Among Studied Population Cross Tab With History of Imprisonment and Duration of Drug Usage

D. Drug.U <sup>a</sup>	H. IMPR <sup>a</sup>		Total
	No	Yes	
<b>&lt;1, y</b>			
Negative	1	NA <sup>a</sup>	1
Total	1	NA	1
<b>1-5, y</b>			
Negative	6	12	18
Positive	0	1	1
Total	6	13	19
<b>5-10, y</b>			
Negative	11	15	26
Total	11	15	26
<b>&gt;10, y</b>			
Negative	19	54	73
Positive	1	2	3
Total	20	56	76
<b>Total</b>			
Negative	37	81	118
Positive	1	3	4
Total	38	84	122

<sup>a</sup> Abbreviations: D. Drug.U, drug duration usage; H. IMPR, history of imprisonment; NA, not available.

between the use of shared needle and HBV infection was demonstrated ( $P < 0.05$ ) (21). Also, in the research by Nokhodian et al. (2012) on female prisoners in Esfahan, results showed that there is no association between the number of arrests and serological HBV markers; their study was limited on one hand by the number of cases that was only 163 and on the other hand it was only conducted on females (22). Another study on females with illegal social behaviors in Esfahan showed the same results, that demonstrated no association between having prison history and HBV infection (23). In a study in Shahrekord, located in West of Iran, by Khosravani et al. (2012) of 158 IDUs, 3.2% were HBsAg positive (24). The prevalence of HBsAg among male IDUs in Tehran was reported to be 5.8%, whereas in Zahedan, South-east of Iran, it was 19.3% among hospitalized IDUs (25). In another study, in Ahvaz, South-west of Iran, HBsAg prevalence was 3.6% among hospitalized drug users (26). In Amin-Esmaili et al. (2012) study on IDUs, in Tehran, the prevalence of past or current HBV infection had a high rate (46.1%), that was mainly correlated with history of imprisonment and drug use of more than 10 years (17). In some reports from Iran (27) and other countries regarding imprisonment (28, 29), the frequency (30) and duration of drug injection (28, 31) are demonstrated as risk factors for HBV infection. Mir-Nasseri et al. (2011) study in Tehran, showed that the prevalence of HBsAg was 3.7% among 518 IDUs (27), they showed that incarceration increased the risk of co-infection by 7.5 folds. This result was confirmed by a similar study by Zamani et al. (2005) (32) on IDUs, and showed that infection was strongly associated with a history of shared drug injection inside prison, whereas it was not significantly related to shared drug injection outside the prison.

In Tofigi et al. study on cadaver of 400 intravenous drug users in Tehran, seroprevalence of HBsAg was 27.5% (3). Merat et al. (2000) (33), Farhat et al. (2003) (34) and Sharif et al. (2009) (35) reported a rate of 1.3%-4%; hepatitis virus infection in IDUs population was associated with sharing injection instruments and a long duration of prison stay and drug usage. Studies from other parts of the world, such as Brazil by Stief et al. (2010) (36) and Berlin showed similar results, as they concluded that positive history of imprisonment is associated with 1.9 fold and 1.5 fold increase in the risk of HBV seropositivity, respectively. Their studies showed that history of syringe sharing in prison was associated with HBV, HCV and HIV infections. A research done by Nguyen et al. (2006), estimated the prevalence of HBV among IDUs in Australia to be 2% - 3%, in this study long term injection, having been to prison, and injecting in prison were independently associated with HBV infection (37). There are also reports of greater than 50% prevalence of HBV among IDUs in other countries around the world such as Germany, Georgia and Bulgaria (28, 38, 39).

Different studies showed that the prevalence of HBV in

Europe and America is respectively more than those of Asia and the Middle East. According to previous studies, the prevalence of HBV among IDUs in Kopenhak drug users, Mexican and Denmark prisoners as well as Spain drug users was 64%, 61.1%, 64% and 67.3% (40-42), respectively, while the prevalence of HBsAg was reported to be 6.2% in Bangladesh (43) and the rate of HBsAg positivity among IDUs in Kabul was demonstrated to be 6.5% (44) and for Karachi, 7.5% (45). In Mirahmadzade et al. (2004) study on IDUs in Shiraz, South of Iran, HBV prevalence was reported to be 3% among the subjects (46). In another study by Javadi et al. (2006) among IDU prisoners in central parts of Iran, the prevalence of HBsAg was 3.5% (47). Rahimi-Movaghar study (2010) on 899 IDUs recruited in Tehran from treatment and harm reduction facilities and from drug users hangouts in public areas in 2007, showed 30.9% HBsAg positivity among these subjects (48). As mentioned before, in the current study the prevalence of HBsAg among IDUs was 3.1% which is slightly lower than those reported from Tehran, Ahvaz, Shahrekord or other parts of Iran (3, 20, 24, 26) (Table 4).

Low rate of HBsAg positivity in this study might be reflected by HBV vaccination; in this study of 98 subjects, 58.2% had a history of HBV vaccination. The study of Khosravani et al. (2012) (24), showed a similar low prevalence for HBsAg positivity among high risk groups, same as IDUs in South-west of Iran studied by Khosravani et al. (2012), where it was concluded that this result may be due to HBV vaccination in that area. It is interesting to note that national levels of 1st (HBV1), 2nd (HBV2) and 3rd (HBV3) dose coverage in Iran have been reported to be 98.9%, 98.8% and 98.4%, respectively (53). After employment of the HBV vaccination in the Iranian national program of Immunization, and the expanded Program of Immunization (EPI) since 1993, the prevalence of HBV has decreased throughout the country (33, 54). Another possibility for reduction in prevalence of HBsAg in our study can be due to harm reduction programs that are provided in DICs, since 2005 there have been continuous attempts to raise coverage of harm reduction intervention in Iran (17). These findings can be a result of the scaling-up of harm reduction facilities such as NSP and MMT that started from 2002 and have been expanded since 2005 in Tehran. A considerable number of IDUs are covered under harm-reduction programs, either in DICs or in prison (55). These results present a good opportunity to receive services for HBV patients to decrease exposure to contaminated blood, as well as risk reduction in high risk behaviors. Drug use is often a hidden behavior in society, and drug users are a kind of hard-to-reach group; therefore, selecting a representative sample of drug users in a geographical area is difficult. Additionally in this study, only IDUs in Tehran were involved, and the results may not be generalized to the entire Iranian IDU population. Due to difficulty in approaching IDUs as a hard-to-reach group,

**Table 4.** Studies on the Prevalence of HBsAg in IDUs in Iran

City	Year	Number of Blood Samples	HBsAg+, %	Reference
Ahvaz	2004	258	1.5	(20)
Esfahan	2009	970	3.3	(18)
Kohgeloyeh and Boyeahmad	2009	158	3.2	(24)
Tehran	2006	864	24.7	(17)
Tehran	2006	499	5.8	(7)
Tehran	2001	518	3.7	(27)
Zanjan	2001	346	3.8	(49)
Tehran	2009	400	27.5	(3)
Tehran	2007	70	6	(50)
Ahvaz	2009	333	3.6	(26)
Tehran	2007	904	30.9	(48)
Esfahan	2008	106	1.8	(51)
Shahrekord	2004	133	6.2	(21)
Tehran	2007	5317	6.7	(52)
Present study	2013	129	3.1	NA <sup>a</sup>

<sup>a</sup> Abbreviation: NA, not available.

we could not gain access to female groups; therefore, further studies are required to examine the studied high risk issue among females. In conclusion, fewer infected cases found in this study promises that in case of performing on-time detriment prevention and decreasing measures will cause future satisfying results in this case.

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## Authors' Contribution

Study concept and design: Maryam Vaezjalali and Latif Gachkar; acquisition of data: Tahmineh Kandelouei and Foad Davoodbeglou; analysis and interpretation: Tahmineh Kandelouei; drafting of the manuscript: Tahmineh Kandelouei; critical revision of the manuscript: Seyed Masoud Hosseini and Maryam Vaezjalali; statistical analysis: Tahmineh Kandelouei; administrative, technical and material support: Maryam Vaezjalali, Seyed Masoud Hosseini and Hossein Keyvani.

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