Original Article

Prevalence of HIV, HBV, and HCV infections and high-risk behaviors among women referred to drop-in centers in Lorestan Province, western Iran

Mokhayeri, H[1], Hasanvand, B[1], Birjandi, M[2], Mirzaei, H[1], Sasaei, P[3], Zamani, S[4], Bajlan, S[4], Akbari, A[5], Khanizadeh, S[6*]

1. *Hepatitis Research Center, Deputy of Health, Lorestan University of Medical Sciences, Khorramabad, Iran*
2. *Department of Biostatistics and Epidemiology, School of Health and Nutrition, Lorestan University of Medical Sciences, Khorramabad, Iran*
3. *Department of Biology, Faculty of Science, Payame Noor University, Tehran, Iran*
4. *Deputy of Health, Lorestan University of Medical Sciences, Khorramabad, Iran*
5. *Faculty of pharmacy, Lorestan university of medical sciences, Khorramabad, Iran*
6. *Hepatitis Research Center, Department of Virology, School of Medicine, Lorestan University of Medical Sciences, Khorramabad, Iran*

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ABSTRACT

Human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV) are known as the most common blood-borne viral infections worldwide. Individuals referring to drop-in centers (DICs) are considered high-risk people exposed to infection with blood-borne viruses. The purpose of this study was to investigate the prevalence of HIV, HBV, and HCV infections among women referred to DICs in Lorestan Province, western Iran. During this cross-sectional study, after obtaining informed consent and completing a demographic form, two blood samples were collected from 118 women referred to Lorestan DICs to be evaluated for HIV, HBV, and HCV infections. Accordingly, the samples were first screened by using the most common serological methods and then by Real-Time polymerase chain reaction (PCR) to detect viral genomes. The results were analyzed using Chi-square statistical test and binary logistic regressions. Out of the 118 blood samples, 8 (6.8%), 4 (3.4%), and 10 (8.5%) subjects tested positive for HIV, HBV, and HCV infection, respectively. Furthermore, our study showed that 5 (4.2%) subjects were positive for HCV/HIV coinfection and 3 (2.5%) cases for HBV/HCV coinfection. Moreover, our data revealed that incarceration and STDs were the most important risk factors for HIV (odds ratio [OR]=15.27; 95% confidence interval [CI]: 3.74-62.89; *P*=0.01) and HBV (OR=16; 95% CI: 1.57-42.34); *P*=0.018) infections, respectively. Our results suggested that women referring to DICs are at risk of infection with blood-borne viruses due to risky behaviors. Thus, precise diagnostic testing and implementation of preventive methods against blood and sexually transmitted infections are urgent in these high-risk groups.

Keywords: DIC, HBV, HCV, HIV, Infection, Risky Behaviors

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Corresponding Author's E-Mail:
khanizadeh.s@lums.ac.ir

1. Introduction

Drop-in centers (DICs) are community-based facilities that cater to drug users, injecting drug users, and sex workers who are at a high risk of contracting viral infections. These organizations offer health and social services through harm-reduction programs. These programs aim to minimize the negative social, economic, and health impacts of drug use, even if the users are unable to quit (1-3). Individuals referring to DICs are considered high-risk people exposed to infection with blood-borne viruses, including hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). This is often because intravenous drug users (IDUs) and vulnerable individuals referring to DICs exhibit dangerous behaviors, such as sharing syringes and similar needles and/or high-risk sexual habits that increase the risk of transmission and infection of the mentioned viruses (4, 5). Vulnerable and drug-using women, women with multiple sexual partners, and those who do not adhere to social norms are those who usually visit these centers (1-3). These individuals are at a high risk of contracting viral infections, especially HIV, HCV, and HBV; therefore, studies have reported a high prevalence of blood-borne infections in such populations (6, 7). Determining the infection rate of HIV, HCV, and HBV helps to better understand the epidemiological characteristics of these infections, particularly in women referred to DICs (8, 9). Therefore, the present study aimed to determine the frequency of HIV, HBV, and HCV infections among women with high-risk behavior who were referred to DICs in Lorestan Province, Iran.

2. Materials and Methods

2.1. Target Population

In the present cross-sectional study, blood samples of 118 women referred to DICs in Khorramabad City, Lorestan Province, western Iran, were collected between September 2021 and December 2022. Eligibility criteria included age > 18 years, residing in Lorestan province for at least six months, and having had high-risk behaviors in the last six months. Exclusion criteria were being under 18 years of age, lack of consent to participate in the study, or refusal to undergo HBV, HCV, and HIV tests. The demographic characteristics of the participants were recorded. The participants were assured of the confidentiality of their personal information. Written consent was obtained from all subjects.

2.2. Sampling and serological screening

Two blood samples with a volume of 5 ml were obtained from each participant. After centrifuge, the serums and plasma were stored at -20°C for further assays. The first samples were screened for hepatitis B surface antigen (HBS Ag ELISA, Dia. Pro Diagnostic Bioprobes Srl, Italy), hepatitis B core antibody (Anti-HBc ELISA, Dia. Pro Diagnostic Bioprobes Srl, Italy), HCV antibody (HCV-Ab ELISA, Dia. Pro Diagnostic Bioprobes Srl, Italy), and HIV (HIV Ab & Ag -p24 ELISA, Dia. Pro Diagnostic Bioprobes Srl, Italy). Subsequently, positive samples were assessed for validation using molecular techniques.

2.3. Molecular assay

2.3.1. Viral genome extraction

To detect genomic viral DNA and RNA in the plasma samples of studied subjects, the viral genomes were isolated from plasma using the QIAamp Viral RNA isolation kit (Qiagen GmbH, Hilden, Germany) based on the manufacturer's procedure. The quality and quantity of the extracted viral genomes were evaluated using the NanoDrop™ spectrophotometer (Thermo Fisher Scientific, Wilmington, NC, USA).

2.3.2. Real-Time PCR technique

The screened samples were further assessed using real-time polymerase chain reaction (PCR) methods (Altona Diagnostics GmbH, Germany) to confirm the positive samples. Accordingly, a positive test for anti-HCV antibodies was described as a past or ongoing HCV infection. Participants with positive HBcAb or positive HBsAg were categorized as individuals with current HBV infection. Co-infections of HIV/HCV, HIV/HBV, and HCV/HBV and related risk factors were also checked out.

2.4 Statistical analysis

The information of each donor was collected during the study. Statistical analysis was performed in SPSS version 22 software using Chi-square statistical test and binary logistic regression. A $P \leq 0.05$ was considered significant for statistical analysis.

3. Results

3.1. Characteristics of participants in the study

As table 1 shows, the mean age of the studied women was 39.22 ± 10.36 years. Most of them were married (45.8%) and had a middle school education (51.7%). In addition, all these individuals were residents of urban areas (100%), and most of them were unemployed (83.1%). Our findings showed that 16.1% of the participants had an addiction history, 56.6% had risky sexual behavior, 17.8% had a sexually transmitted disease (STD), and 7.6% had a prison history.

3.2. Prevalence of HCV, HBV, and HIV infection among the studied women

In this study, 9 (7.6%), 4 (3.4%), and 10 (8.5%) cases out of the 118 women were positive for HIV- Ab, HBsAg, and HCV-Ab, respectively (Table 2). Subsequently, the samples were molecularly evaluated using the real-time PCR method. Molecular analysis indicated that out of the 118 cases, 8 (6.8%), 4 (3.4%), and 10 (8.5%) cases were positive for HIV, HBV, and HCV infections, respectively. Furthermore, the results also showed that 5 (4.2%) subjects were positive for HCV/HIV coinfection and 3 (2.5%) cases for HBV/HCV coinfection.

Table 1. Demographic data of the evaluated population

Variable	N. of cases (118)	Percent (%)
Mean age (SD, Min-Max)	39.22 (10.36, 18-66)	-
Marital Status		
Married	54	45.8
Divorced	15	12.7
Unmarried	39	33.1
Other	10	8.5
Education		
Higher	19	16.1
Mean	61	51.7
Preliminary	32	27.1
Uneducated	6	5.1
Occupation		
Employed	20	16.9
Unemployed	98	83.1
Addiction		
Yes	19	16.1
No	99	83.9
Incarceration		
Yes	9	7.6
No	109	92.4
STDs		
Yes	21	17.8
No	97	82.2
Risky Behavior		
Yes	55	56.6
No	63	53.4
Genitalulcer		
Yes	30	25.4
No	88	74.6

Table 2. The results of serological screening and Real Time-PCR for HIV, HBV, and HCV detection.

	Serological Screening (ELISA)		**Real Time-PCR**		**Total N.**
Virus	Positive (%)	Negative (%)	Positive (%)	Negative (%)	
HIV	9 (7.6)	109 (92.4)	8 (6.8)	110 (93.2)	118
HBV	4 (3.4)	114 (96.6)	4 (3.4)	114 (96.6)	
HCV	*10 (8.5)*	*108 (91.5)*	*10 (8.5)*	*108 (91.5)*	

3.3. Association between risk factors and prevalence of HCV, HBV, and HIV among the studied women

Table 3 shows the significant association between risk factors and HBV, HCV, and HIV infections. The results demonstrated that incarceration and STDs were the most important risk factors for HIV and HBV infections, respectively. In other words, the risk of HIV infection was 15.7 times higher in women with a prison history (95% confidence interval [CI]: 3.74-62.89; *P*=0.01), and those women who had a history of STDs were 16 times more susceptible to being infected with HBV compared to women without a history of STDs (95% CI: 1.57-42.34; *P*=0.018).

4. Discussion

As a behavioral counseling center, DICs play a crucial role in reducing high-risk behaviors among vulnerable women in society. The center's action plan aims to identify and prevent public health threats, such as drug use and viral infections. Additionally, it educates drug users and their families on safe sexual behavior while also promoting a shift from risky to safe sexual practices (2, 10-12). Women who use drugs, wives of drug users, and those with multiple sexual partners are at a higher risk of contracting blood-borne viral infections, such as HIV, HBV, and HCV (5). Therefore, this study aimed to determine the prevalence of HIV, HBV, and HCV infections among women exhibiting high-risk behaviors who were referred to DICs in Lorestan Province. The analysis of our results showed that among the demographic characteristics of the women in this study, a significant percentage (56.6%) of the cases had a history of risky sexual behavior. Moreover, most of the subjects had a middle school or lower education level (83.9%) and were unemployed (83.1%). All the people lived in urban areas, and about 45.8% of them were married. Our findings also showed that 16.1% of the participants had an addiction history, 17.8% had a STD, and 7.6% had a prison history. Regarding the prevalence of the viral pathogens in this study, 9 (7.6%), 4 (3.4%), and 10 (8.5%) cases out of the 118 women were positive for HIV-Ab, HBsAg, and HCV-Ab, respectively (Table 2). Additionally, the molecular analysis indicated that out of the 118 cases, 8 (6.8%), 4 (3.4%), and 10 (8.5%) cases were positive for HIV, HBV, and HCV infections, respectively. Regarding this discrepancy between the serological and molecular results, it should be noted that several different methods are used for blood-borne virus detection, including (i) enzyme-linked immunosorbent assay (ELISA) for the detection of anti-viral antibodies and/or viral antigens, and (ii) Real-time PCR for the detection of viral RNA/DNA. This discrepancy may be a result of the fact that in the ELISA approach, false-positive/-negative cases may occur because serology testing has a lower sensitivity and specificity compared to molecular ones (13). Furthermore, the results also showed that 5 (4.2%) subjects were positive for HCV/HIV coinfection and 3 (2.5%) cases for HBV/HCV coinfection. In our study, the logistic regression analysis demonstrated that incarceration and STDs were the most important risk factors for transmitting HIV and HBV infections, respectively. In other words, the risk of HIV infection was 15.7 times higher in women with a prison history (95% CI: 3.74-62.89; *P*=0.01). Women who had a history of STDs were 16 times more susceptible to being infected with HBV compared to women without a history of STDs (95% CI: 1.57-42.34; *P*=0.018). Our results were similar to those reported in other studies from Iran, such as that carried out by Moayedi et al., who reported that among 161 sexually active women, 5% were HIV positive, 8.1% were infected with HCV, and 1.2% with HBV infection. Their result also showed that there was a significant association between HIV infection and co-infections with HSV-1 and HSV-2 (14). In the same way,

Table 3. The major risk factors for HIV, HCV, and HBV infection.

	HIV		HCV		HBV	
Variable	**P Value**	**OR (95% CI)**	**P Value**	**OR (95% CI)**	**P Value**	**OR (95% CI)**
Incarceration	0.01	15.27 (3.7-62.8)	0.2	0.02 (0.01-0.3)	0.3	0.05 (0.04-0.7)
STDs	0.1	14.6 (0.4-46)	0.5	0.6 (0.07-4.5)	0.01	16 (1.57-42.3)
Genitalulcer	0.5	1.6 (0.4-4)	0.3	0.14 (0.4-1.2)	0.17	1.3 (0.7-2.3)
Addiction	0.13	0.8 (0.4-2.1)	0.07	0.9 (0.3-1.8)	0.27	1.6 (0.9-2.5)
Risky Behavior	0.46	0.3 (0.03-5.5)	0.64	0.6 (0.03-1.03)	0.2	0.4 (0.05-1.3)
Occupation	0.13	0.8(0.2-2.2)	0.49	1.2 (0.6-3.7)	0.5	0.9 (0. 6-1.2)
Education	0.45	0.63 (0.1-2.7)	0.18	3.8 (0.09-1.5)	0.31	0.7 (0. 3-1.1)
Marital Status	0.6	1.2 (0.4-3.9)	0.15	2.01 (0.7-5.2)	0.41	1.2 (0. 7-3.1)
Age	0.16	0.9 (0.8-1.3)	0.5	1.3 (0.9-1.03)	0.51	0.9 (0. 3-1.7)

another study from Iran conducted by Shahry et al. assessed the prevalence of HBV, HCV, HIV, and related factors among the homeless population of southeast Iran in 2019 (15). Their results demonstrated that the prevalence rates of HCV, HBV, and HIV were 13%, 2.7%, and 0.3%, respectively. In that study, it was shown that a history of imprisonment (odds ratio=2.32) can act as a predicting factor for HCV infection (15). Similarly, Foroughi et al. evaluated the prevalence of HIV, HBV, and HCV infections among street and labor children in Tehran, Iran (16). Their findings indicated that 4.5% of cases were HIV infected, 1.7% were HBV-infected, and 2.6% were infected with HCV. In that study, having parents positive for HCV with a history of trading sex significantly increased the chance of infection with HIV among the studied cases (16). Furthermore, Irani et a. evaluated the prevalence of HCV, HBV, and HIV in 307 homeless men in the west of Iran. Their data showed that the prevalence rates of HCV, HBV, and HIV were 6.5%, 1%, and 31.27%, respectively. Moreover, the highest prevalence of coinfection was related to HIV/HCV coinfection (5.7%), and most of the subjects had a drug use history, such as methamphetamine and opium (17-20). In a systematic review study conducted by Bagheri et al. in Iran (2016), it was found that the prevalence of HIV, HBV, and HCV infections in high-risk individuals was 17.25%, 30.9%, and 51.46%, respectively. Their results also suggested that the highest prevalence of coinfection was associated with HIV/HCV (10.9 %) and HIV/HBV (1.88%) (19). Similar to the findings reported by the mentioned studies from Iran, in the current study, we observed that HCV had the highest prevalence among the viral infections followed by HIV and HB; therefore, HCV not only had the highest prevalence but also was the most prevalent coinfection among the other viruses (i.e., HIV and HBV). Our results showed a high incidence of HIV, HBV, and especially HCV among women with high-risk behaviors referring to DICs in Lorestan Province for the first time. These infections may result from a lack of awareness in the target population in the field of blood-borne viral infections. Therefore, the results of our study have highlighted the necessity for preventative measures to be taken by women to reduce and handle infections of HIV, HBV, and HCV. Moreover, our data underscores the urgent need for training courses and workshops to identify patients and complete their health records. This is essential for preventing high-risk behaviors among individuals at high risk.

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Authors' Contribution
SK designed the study. BH, HM, and SZ collected the clinical data and performed experiments. MB analyzed the data. SK and BH wrote the main manuscript. SB and AA reviewed the manuscript. All authors accepted the final version of this manuscript.

Ethics
This study was approved by the Ethics Committee of the Lorestan University of Medical Sciences (1-1449-10-A).

Conflict of Interest
The authors declare that they have no competing interests.

Data Availability
The data that support the findings of this study are available on request from the corresponding author.

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