

Donors with Positive Hepatitis B and C Infections and Their Demographic Characteristics, a Study in Jirof Blood Donation Center From 2011 to 2016

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ARTICLE INFO

Article History:

Received September 4, 2021

Accepted March 10, 2022

Published online June 30, 2022

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Abstract

Introduction: Blood-borne infections have always been concerns for the health system, as well as patients receiving blood products. In the present study, our aim was to determine the prevalence of hepatitis B (HBV) and C (HCV) virus infections in the blood units donated in Jiroft city, Kerman province, Iran, during a 5-year period (2011-2016). We also analyzed the demographic characteristics of donors.

Methods: This was a cross-sectional study. Records available in the blood center of Jiroft was used as the source for collecting the data required (i.e., demographic features, results of laboratory tests, etc.). SPSS software version 22 was used to analyze the data using descriptive statistics (frequency and percentage). The chi-square test was used to identify any association between categorical variables at a significant level of $P < 0.05$.

Results: The total number of blood donors was 36117. Hepatitis B and C frequencies were 3.3 and 0.44 per 1000, respectively. The highest infection rates were observed in 21-30-year-old donors. The prevalence of hepatitis B and C were higher among first-time, married, and male donors. Hepatitis B and C frequencies indicated a decreasing trend, reaching 2 and 0.4 per 1000 in 2016 from the initial 5.2 and 0.55 per 1000 in 2011, respectively. The results of the Chi-square statistical test showed that the difference in the number of people who had hepatitis in the period of 2011-2016 had a statistically significant decreasing trend ($P < 0.001$).

Conclusion: The prevalence of hepatitis B and C infections in blood donors declined from 2011 to 2016. It is recommended to continue screening tests and educate donors to even lower blood-borne viral infections among Jiroft blood donors.

Keywords: Hepatitis B, Hepatitis C, Blood transfusion

Please cite this article as follows: Sadeghi Dousari A, Satarzadeh N, Behzadi A, Mirzaee Khalilabadi R donors with positive hepatitis b and c infections and their demographic characteristics, a study in jirof blood donation center from 2011 to 2016. Int J Basic Sci Med. 2022;7(2):57-60. doi:10.34172/ijbms.2022.10.

Introduction

Blood transfusion and blood products are the only way to save a patient's life in many cases.¹ One of the main goals of the Blood Transfusion Organization is to provide healthy blood and prevent the transmission of blood-borne infectious diseases.²⁻⁴ The health of blood and blood products depends on the health status of donors, the outbreak of blood-borne diseases, and the sensitivity of screening tests.⁵⁻⁹ The blood-borne viral infections include the human immunodeficiency virus (HIV), hepatitis B (HBV), and hepatitis C (HCV).^{10,11} Hepatitis B and C virus were detected by Blumberg in 1963 and 1989

respectively.^{12,13} Hepatitis B virus has double-stranded circular DNA from the Hepadnaviridae family. Hepatitis B infection is one of the worldwide health problems and is the main cause of hepatocellular carcinoma, chronic hepatitis, and liver cirrhosis.¹⁴⁻¹⁶ Hepatitis C also leads to cirrhosis and liver cancers which require long-term treatment due to its major role in chronic liver diseases.^{12,13}

Today, using the third-generation ELISA kits, the risk of transmission of viral pathogens has been significantly reduced.¹⁷⁻¹⁹ For minimizing the risk of transmission of hepatitis B and C, the proper screening of blood donors is required, including selecting healthy donors based on the



SOP (standard operating procedure) of the Iranian Blood Transfusion Organization. Therefore, to provide healthy blood, awareness of the frequency of viral contamination in different groups of donors is important. This study aimed to determine the prevalence of hepatitis B and hepatitis C among blood donors in 2011-2016 at Jiroft Blood Transfusion Center.

Materials and Methods

This was a retrospective descriptive study and approved by the ethics committee of Kerman University of Medical Sciences with the code of IR.KMU.REC.1398.40. This study analyzed the data of all blood donors referred to the blood transfusion center of Jiroft from March 2011 to March 2016. The information of each blood donor was extracted from the integrated "Into" system of the Blood Transfusion Organization of Iran. The total number of donors was 36117, of whom 134 were positive for hepatitis B and C virus infections. Then, demographic characteristics (age, sex, marriage, education, and history of blood donation) of donors testing positive for these viruses by ELISA (HBsAg and anti-HCV) were analyzed.

Blood donors were divided into three groups according to the history of blood donation. ELISA kits used by the organization had been purchased from Bio-Rad (United States), Hepanostika (France), and Siemens (Germany) companies. In this division, first-time donors were defined as those who have only one record of blood donation and is donating blood for the first time in their life. Repeat donors had a history of donating blood but in intervals exceeding 1 year. Regular donors were people who donated blood at least twice a year. Data were analyzed using SPSS software version 22, and descriptive statistics, frequency distribution tables, and percentages were used to describe the data.

Results

The majority of blood donors were in the 21-30-year-old group. Of the donors, 91% were male, and 9% were female; 79.1% were married; 20.1% were single, and 0.7% were divorced. In terms of education, 75.4% had lower than a diploma, and 24.6% had higher than a diploma. In terms of the history of blood donation, 89.6% were first-time donors, 5.2% had regular donors, and 5.2% were repeat donors (Table 1).

One hundred eighteen were positive for HBsAg (hepatitis B surface antigen), and sixteen were anti-HCV positive. The overall prevalence of HBs Ag and anti-HCV positivity was 0.33% and 0.044%, respectively, as shown in Figure 1.

The prevalence of hepatitis B among donors in 2011-2016 was 118 (Table 2), of whom 107 were males and 11 were females. The highest frequency (38 cases) was observed in 2011-2012, and the highest frequency was in the age range of 31 to 40 years old. Out of 118 cases

with positive HBV, 91.5% were first-time donors, 3.4% were regular-based donors, and 1.5% were repeat donors. Moreover, 78% of the patients with hepatitis B were married; 21.2% were single, and 0.8% were divorced.

The results of the Chi-square statistical test showed a statistically significant declining trend in the incidence of hepatitis B positivity in the period of 2011-2016 ($P < 0.001$).

The frequency of hepatitis C in 2011-2016 was 16, of whom 15 were male, and one was female. The highest frequency was seen in 2012-2013, with five infections. The highest frequency was related to the age category of 41 to 50 years old; 87.5% of those with positive HCV were married, and 75% of them were first-time donors.

Discussion

Hepatitis B virus infection prevalence in Iranian population is around 3%, which declined to around 1.7% after the onset of vaccination programs in 1995. The global prevalence of hepatitis C is around 1%, and among Iranian donors, it has been reported to be about 0.46%, showing a rise from previously reported 0.3%.¹² Our aim was to evaluate the frequency of hepatitis B and C in blood donors in Jiroft city between 2011 and 2016. Our results indicated that HBV infection was more prevalent than HCV infection among Jiroft blood donors.

Table 1. Frequency Distribution and Frequency of Hepatitis B and C of 134 Donors and Their Demographic Characteristics, Referring to Jiroft Blood Transfusion Center

Variables	No. (%)	Hepatitis B Positive No. (%)	Hepatitis C Positive No. (%)
Age (y)			
<20	2 (5.1%)	2 (1.7%)	0 (0%)
21-30	47 (35.1%)	41 (34.7%)	6 (37.5%)
31-40	44 (32.8%)	42 (35.6%)	2 (12.5%)
41-50	31 (23.1%)	23 (19.5%)	8 (50%)
>50	10 (7.5%)	10 (8.5%)	0 (0%)
Gender			
Male	122 (91%)	107 (90.7%)	15 (93.8%)
Female	12 (9%)	11 (9.3%)	1 (6.3%)
Marital status			
Single	27 (20.1%)	25 (21.2%)	2 (12.5%)
Married	106 (79.1%)	92 (78%)	14 (87.5%)
Divorced	1 (8%)	1 (0.7%)	0 (0%)
Education level			
Diploma and less	101 (75.4%)	85 (72%)	16 (100%)
Higher than diploma	33 (24.6%)	33 (24.6%)	0 (0%)
History of blood donation			
First-time	120 (89.6%)	108 (91.5%)	12 (75%)
Repeated	7 (5.2%)	4 (3.4%)	3 (18.8%)
Regular	7 (5.2%)	6 (5.1%)	1 (6.3%)

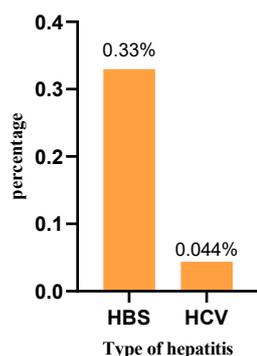


Figure 1. Frequency of Hepatitis B and C in Blood Donors Referring to Blood Transfusion Center of Jiroft City in 2011-2016

Table 2. Frequency of Hepatitis B and C in 2011-2016 in Separate Years

Year	Number of Donors	Hepatitis B		Hepatitis C	
		Number	Percent	Number	Percent
2011-2012	7313	38	0.52	4	0.055
2012-2013	7367	24	0.32	5	0.067
2013-2014	6835	29	0.42	2	0.029
2014-2015	7220	12	0.166	2	0.027
2015-2016	7382	15	0.2	3	0.04
Total	36117	118	0.33	16	0.044

The overall frequencies of hepatitis B and C infections in donated blood samples were 3.3 and 0.44 per 1000 in the studied years. Hepatitis B and C infection prevalence was higher among first-time donors than in regular donors. It may be due to the first-time donors' unawareness about the importance of donating blood and their refusal to express high-risk behaviors. Besides, some first-time donors may be just willing to check their health status. Sorouri Zanjani et al⁴ in Zanjan, Iran, reported that the prevalence of HBV infection was 0.3%, and the prevalence of HCV infection was 0.1%, noting a higher prevalence of hepatitis B in the elderly, married, and illiterate people, while both hepatitis B and C infections were more prevalent among first-time blood donors. In a similar study conducted by Yazhan et al¹⁰ on donors in Sabzevar, the frequency of hepatitis B and C was 3 and 0.2 per 1000. The prevalence of the infections was higher among single compared to married women and in first-time donors than in repeat and regular donors, which was consistent with the present study. In contrast to the report of Yazhan et al,¹⁰ the number of affected males was higher than females in our study. In a study on the prevalence of hepatitis B and C in Shiraz blood donors,⁵ the prevalence of hepatitis B was reported to be higher than hepatitis C, which was similar to the current study. In the recent study, the prevalence of hepatitis B in first-time donors was higher in males and females, which was similar to the present study. In another study on blood donors in Semnan, Iran, one hundred cases were reported to be

positive for hepatitis B and 26 for hepatitis C from 2011 to 2014, and the highest prevalence was related to first-time donors and married males,²⁰ which was in line with the present study. Similar studies have been done in other countries. In 2007, a study assessed that the prevalence of hepatitis B and hepatitis C virus among blood donors in Alexandria, Egypt, and reported that HBV and HCV frequencies were the highest among males,²¹ similar to our results. In Agogo, Ghana, Nkrumah et al²² showed a higher frequency of HBV than hepatitis C, with a decreasing trend toward 2008 (hepatitis B: 6.9%, hepatitis C: 7%) compared to 2006 (hepatitis B: 13.8%, hepatitis C: 9.4%). In the present study, hepatitis B and hepatitis C frequencies decreased from 2011 toward 2016. Another study in Cameroon, it was demonstrated that HBV and HCV infection prevalence was 12.14% and 1.44%, respectively; the overall prevalence of both hepatitis B and hepatitis C was higher among males than females, and the highest hepatitis B frequency was noted in the age group of 20 and 30 years old,²³ which was similar to the present study. A retrospective study performed between 2005 and 2009 by Meena et al²⁴ showed that hepatitis B and hepatitis C prevalence among Indian blood donors was 1.43% and 0.57%, respectively. From 2005 to 2009, a decrease was observed in HBs Ag positivity from 1.53% to 1.26%, which was similar to our study. However, Meena et al²⁴ reported an increase in HCV from 0.18% to 0.82%, which was different from our results.

We observed a decrease in viral infections' prevalence in 2014 compared to 2011 and before, which indicated the effectiveness of donor screening and selection programs.⁵ Wasfi and Sadek argued that the declining trend in the frequency of viral hepatitis among blood donors may be due related to a variety of factors, including the exclusion of high-risk donors and those who have been in exposition to potential carriers of blood-borne infections.²¹ However, El Beltagy et al demonstrated a significant relationship between positive HBV blood donors and advanced age.²⁵ Similarly, Said et al²⁶ did not indicate an association between any risk factors and occult hepatitis B infection except for age. Our study showed that the incidence of hepatitis B infection was lower in the age group of 21-30 years compared to the 31-40 age group, whereas most blood donors were in the 21-30-year-old group.

Conclusion

The reduction of the prevalence of hepatitis B and C infection in blood donors in Jiroft during 2011-2016 could indicate the effectiveness of donor screening and selection programs. Due to the low prevalence of transmissible viruses through the blood in regular donors, it seems better to use regular donors to ensure healthy blood supply. However, to further improve the safety of blood donations, training programs are suggested, especially for first-time and married donors, as well as teenagers who

will become future blood donors.

Acknowledgments

We gratefully thank the Iranian Blood Transfusion Organization for providing valuable data.

Authors' Contributions

ASD, NS, and AB participated in data collection, manuscript preparation. ASD also participated in data analysis. RMK was involved in methodology, data analysis, and critically revising the manuscript for important intellectual content.

Competing interests

None of the authors have any conflicts of interest to declare.

Ethical Approval

This study was approved by the ethics committee of Kerman University of Medical Sciences with the code of IR.KMU.REC.1398.40.

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