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Comparing the Prevalence of Hepatitis B Virus Infection in Stationary and Mobile Blood Donation Centers: A Cross-Sectional Descriptive Study

Mohammadreza Ameli,[1] Mahsa Najafzadeh,[2] and Seyed Mehdi Sajjadi[3,*]

[1]Iranian Blood Transfusion Organization Research Center, South-Khorasan Blood Transfusion Service, Birjand, IR Iran
[2]Student Research Committee, Birjand University of Medical Sciences, Birjand, IR Iran
[3]Cellular and Molecular Research Center, Birjand University of Medical Sciences, Birjand, IR Iran

[*]*Corresponding author*: Seyed Mehdi Sajjadi, Cellular and Molecular Research Center, Birjand University of Medical Sciences, Birjand, IR Iran. E-mail: mehdi.sadjadi@bums.ac.ir

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Abstract

Background and Aim: Blood transfusion can save a million lives. Nonetheless, every recipient is at risk for transfusion-transmissible infection, chiefly hepatitis B infection. The aim of this study was to compare stationary and mobile blood donation centers respecting the prevalence of hepatitis B in 2007 - 2016.

Methods: This cross-sectional descriptive study compared hepatitis B prevalence in stationary and mobile blood donation centers in Southern Khorasan in a ten-year period from 2007 to 2016. Data were retrieved from data sheets available from Iranian blood transfusion organization.

Results: A total of 157063 blood units had been collected in 2007 - 2016. The number of blood units collected by stationary and mobile centers was 129,899 (82.7%) and 27,164 (17.3%), respectively. Total hepatitis B prevalence rate was 0.22% (348 cases). This rate in stationary and mobile centers was 0.18% (232 cases) and 0.40% (116 cases), respectively. Hepatitis B prevalence was significantly greater in mobile centers than in stationary centers ($P < 0.001$). Moreover, hepatitis B prevalence in the second five years, i.e. 2012 - 2016, was significantly lower than that in the first five years, i.e. 2007 - 2011 ($P < 0.001$).

Conclusions: Hepatitis B prevalence in mobile blood donation centers is significantly higher than that in stationary centers. This problem can be due to the limited health-related knowledge of blood donors in rural areas where mainly mobile centers collect blood units. Therefore, restricting blood collection by mobile centers may be indicated until necessary health- and donation-related educations are provided to all people in high-risk areas.

Keywords: Blood Transfusion, Hepatitis B Virus Infection, Stationary Blood Donation Center, Mobile Blood Donation Center

1. Background

Each year, more than ninety million blood units are collected worldwide (1), while around one-third of the global population needs blood or blood product transfusion in their lives (2, 3). The American Red Cross reported that 38,000 units of packed blood cells are transfused each day and 3.5 million people receive blood transfusion each year (4). Given the small supply of blood products and the high demand for them, Bloodstock is low and there will be a critical blood shortage in future (5). Therefore, effective strategies and plans are needed for the recruitment and retention of healthy blood donors and the removal of the barriers to healthy blood donation.

One of the major barriers to blood donation in Iran is the shortage of blood donation centers, particularly in rural areas. An effective strategy for removing this barrier is to use mobile blood donation centers in rural areas and in crowded places such as hospitals, schools, and military centers (6-8). Currently, about 20% of blood donation in Iran is performed in mobile centers and 80% in 283 stationary centers (9).

Although blood transfusion can save a million lives, an unhealthy blood transfusion can lead to devastating consequences for blood recipients, their families, and societies (2, 3). One of the most prevalent and life-threatening consequences of blood transfusion is transfusion-transmissible infections (TTIs), mainly immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV). HBV is the most common transfusion transmissible infection (3, 10, 11).

Estimates show that there are around 350 million HBV carriers in the world (12). HBV carriage rate in Iran is

around 0.4% (3, 13). A study showed that HBV prevalence among blood donors who had and had not completed confidential unit exclusion forms was 3.4% and 0.5%, respectively (14). HBV prevalence among blood donors is an important indicator for the evaluation of the quality of blood donation procedures, educations, and screening programs (2). Yet, there are limited comparative studies respecting the quality of blood products collected by stationary and mobile blood donation centers in southern Khorasan, Iran. The aim of this study was to compare stationary and mobile blood donation centers respecting HBV prevalence in 2007 - 2016 in southern Khorasan.

2. Methods

This cross-sectional descriptive study compared HBV prevalence in stationary and mobile blood donation centers in Southern Khorasan in a ten-year period, i.e. from 2007 to 2016. Blood donors were excluded if they had completed the confidential unit exclusion form. All donated blood units had been evaluated for HBV using enzyme-linked immunosorbent assay kit (Dade-Behring, Siemens, Germany). The blood samples with positive HBV result had been double-tested. Samples with positive results in the second test had then been subjected to further laboratory testing for hepatitis B core antigen-antibody and hepatitis B surface antigen neutralization (Dade-Behring, Siemens, Germany). HBV prevalence assessment was done based on the results of confirmatory tests. The Chi-square test at a significance level of less than 0.05 was done using the SPSS software (v. 16.0) to compare stationary and mobile blood donation centers respecting HBV prevalence. We did not retrieve blood donors' demographic characteristics. Moreover, donors' personal information was confidential and only blood transfusion staff could access them. Therefore, the data collected in this study were anonymous. The ethics committee of Birjand University of Medical Sciences approved the ethical considerations of the present study under No. Ir.bums.REC.1396.248.

3. Results

A total of 157063 blood units had been collected in 2007 - 2016. The number of blood units collected by stationary and mobile centers was 129,899 (82.7%) and 27,164 (17.3%), respectively.

Total HBV prevalence rate was 0.22% (348 cases). This rate among blood units collected in stationary and mobile centers was 0.18% (232 cases) and 0.40% (116 cases), respectively. HBV prevalence was significantly greater in mobile centers than in stationary centers ($P < 0.001$; Table 1). Moreover, HBV prevalence in the ten-year assessment period showed a downward trend (Table 2), so that HBV prevalence in stationary centers during the second five years, i.e. 2012–2016, was significantly lower than that in the first five years, i.e. 2007 - 2011, (0.1% vs. 0.3%; $P < 0.001$). The same finding was observed in mobile centers (0.2% vs. 0.6%; $P < 0.001$). Accordingly, HBV prevalence at the end of the ten-year period was significantly lower than the prevalence in the beginning of the period.

Table 1. Total HBV Prevalence in Stationary and Mobile Blood Donation Centers in 2007 - 2016

HBV Test Results	Stationary Centers	Mobile Centers	Statistical Analysis
Positive	232 (0.2)	116 (0.4)	$\chi^2 = 62.72$
Negative	129667 (99.8)	27048 (99.6)	$P < 0.001$
Total	129899 (100)	27164 (100)	-

4. Discussion

Study findings showed that 17.3% of all blood units had been collected by mobile blood donation centers. This is almost the same as the total rate in Iran, i.e. 20% (12). However, a study in the United States showed that in 2006 - 2009, most blood units had been collected by mobile centers. Another study in China also reported the same finding (14). These findings indicate that the rate of blood donation in mobile centers in Southern Khorasan is almost similar to the national average but much lower than the rates in developed countries such as the United States and China.

Findings also indicated that HBV prevalence was significantly greater in mobile blood donation centers than in stationary centers. An earlier study in Iran also reported the same finding (3), while a study in India showed that HBV prevalence in stationary centers was significantly greater than that in mobile centers (8). The greater HBV prevalence in mobile centers in the present study can be attributed to the lower level of health knowledge among people referring to these centers. Another explanation is the greater number of first-time blood donors in mobile centers. TTIs are known to be more prevalent among first-time blood donors (3, 11). These findings highlight the necessity of quality public education in rural areas in order to have greater access to healthy blood products. It is noteworthy that about 40% of people in southern Khorasan live in rural areas, where they have limited access to stationary blood donation centers. Therefore, mobile centers in these areas can significantly contribute to blood procurement.

Table 2. Annual HBV Prevalence in Stationary and Mobile Blood Donation Centers in 2007 - 2016[a]

Year	Number of Donations	Number Of Hbsag-Positive Cases		
		Stationary Centers	Mobile Centers	Total
2007	11677	34 (0.29)	25 (0.21)	59 (0.50)
2008	13103	35 (0.26)	16 (0.12)	51 (0.38)
2009	11730	23 (0.19)	22 (0.19)	45 (0.38)
2010	11825	19 (0.16)	12 (0.10)	31 (0.26)
2011	13078	18 (0.13)	12 (0.09)	30 (0.22)
2012	17506	12 (0.07)	6 (0.03)	18 (0.10)
2013	18028	22 (0.12)	4 (0.02)	26 (0.14)
2014	19102	30 (0.15)	8 (0.04)	38 (0.19)
2015	20386	26 (0. 12)	7 (0.04)	33 (0.16)
2016	20628	13 (0.07)	4 (0.01)	17 (0.08)
Total	157063	232 (0.15)	116 (0.07)	348 (0.22)

[a]Values are expressed as No. (%).

The other finding of the study was a significant decrease in HBV prevalence from 2007 to 2016. Other studies in Iran also reported the same finding. For instance, a study showed that HBV prevalence decreased from 573 per 100,000 cases in 2005 to 256 per 100,000 cases in 2013 (3). Another study also reported a significant decrease in HBV prevalence from 423 per 100,000 cases in 2008 to 153 per 100,000 cases in 2013 (15). Studies in other countries also confirmed significant decreases in HBV prevalence over time (16-18). This decrease in HBV prevalence can be attributed to extensive and serious HBV immunization programs for all Iranian neonates since 1993 (19, 20). Other explanations may be systematic screening of all donated blood, full exemption of infected people from blood donation, public education respecting blood-borne infections, and confidential unit exclusion programs.

4.1. Conclusions

HBV prevalence among blood units collected by mobile blood donation centers is significantly higher than the prevalence in stationary centers. This problem can be due to the limited knowledge of blood donors in rural areas where mainly mobile centers collect blood units. Therefore, restricting blood collection by mobile centers may be indicated until necessary health- and donation-related educations are provided to all people in high-risk areas.

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