Iranian Journal of Virology 2018;12(1): 32-39
©2018, Iranian Society of Virology

Original Article

The Prevalence of Hepatitis B, Hepatitis C and AIDS in Blood Donors in Ilam Province: A Retrospective Study

Fariba Mohammadi Tahroodi[1], Nima Abdyazdani[2], Fatemeh Shakeri[3], Maryam Rahmani[4], Mahya Sadat Afrazian[5], Mojtaba Abbasi[6], Vahid Mogharabzadeh[7], Sadra Samavarchi Tehrani[8], Maryam Moradi[9], Haleh Barmaki[10,*]

1. Department of Biochemistry, School of Medicine, Kerman University of Medical Sciences, Kerman, Iran.
2. Department of Biochemistry and Clinical Laboratories, Faculty of Medicine, Tabriz University of Medical sciences, Tabriz, Iran.
3. Msc of Midwifery, Jahrom University of Medical Sciences, Jahrom, Iran.
4. Veterinary Medicine, Faculty of Veterinary Medicine, Shahid Bahonar University of Kerman, Kerman, Iran.
5. Department of Biology, Faculty of Basic Sciences, University of Shiraz, Shiraz, Iran.
6. Veterinary Medicine, Faculty of Veterinary Medicine, Shahrekord Branch, Islamic Azad University, Shahrekord, Iran.
7. Department of Biostatistics, Faculty of Health, Mazandaran University of Medical Sciences, Sari, IR Iran.
8. Student Research Committee, Babol University of Medical Sciences, Babol, Iran.
9. Department of Immunology and Hematology, Faculty of Medicine, Kurdistan University of Medical sciences, Sanandaj, Iran
10. Department of laboratory Medicine, Faculty of Paramedical sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Abstract

Background and Aims: One of the most important goals of blood transfusion organizations throughout the world is to provide healthy blood and prevent the transmission of various infectious diseases with blood. Viral hepatitis (HBV and HCV)ccc and HIV are the most important and dangerous threats to the blood transfusion system. Therefore, the aim of this study was to determine the prevalence of hepatitis C, hepatitis B and AIDS in healthy blood donors in Ilam province, west of Iran.

Materials and Methods: In this retrospective cross-sectional study, the prevalence of HBV, HCV and HIV was evaluated in 145273 blood donors from 2007 to 2017 who referred to the blood transfusion center of Ilam province. Screening for HIV, HBV and HCV was done with ELISA.

Results: From 145,273 donors, 249 cases were HBV positive, 66 were HCV positive and 6 were HIV positive. Among the total number of people infected with these viruses, 202 were married and 119 were single. The prevalence of HBV, HCV and HIV in men was significantly higher than in women ($P < 0.01$). Meanwhile, the rate of disease was higher in individuals over the age of 40 compared to those aged 20 to 40 years old ($P < 0.01$).

Conclusions: The results of this study revealed that blood-borne infections in blood donors in Ilam province have a lower prevalence regarding the results of other studies carried out in other regions of Iran as well as other countries. The exact screening of the blood of male donors over the age of 40 is essential. Therefore, the accurate selection of blood donors is recommended with a view to ensuring the safety of blood recipients, with the emphasis on the sensitivity and specificity of screening methods.

Keywords: Hepatitis B Virus, Hepatitis C Virus, Human Immunodeficiency Virus, Blood Transfusion, Infectious Diseases with Blood.

Introduction

Blood transfusion has been carried out to save lives for decades. Blood transfusion services are required in some clinical conditions such as anemia, thalassemia, and hemophilia (1). Today, blood transfusion organizations around the world are trying to provide safe blood and blood products with the use of the latest and most advanced laboratory methods, quality control tests, quarantine plasma products, and the use of viral removal methods (2). Blood donation saves the lives of millions around the world (3). In fact, the goal of blood transfusion is to protect lives, but at the same time, it can be dangerous if blood safety is not taken into consideration (4). Unsafe blood transfusion is followed by disastrous consequences for the individuals as well as the economy of a society. Poisoning and deaths caused by contaminated blood transfusion can be a threat not only to the recipients but also to their families and communities (5). Since an individual can transmit the infection through an asymptomatic phase, blood transfusion can increase the transmission of viral infections in the population (5). In developing countries, the risk of transmission of infectious diseases transmitted through the blood can be minimized by appropriate selection of donors, promoting voluntary donation and improving serologic tests (6). In developed countries where screening for infectious diseases is universal, there is still a potential risk of transmission of viral infections during the serological window period after infection, when antibodies are still not detectable (6).

In recent years, increased concern about blood transfusion safety associated with blood-borne infections is mainly due to hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) infection (7). These viruses can be transmitted through direct contact with contaminated blood and blood products, organ transplants, hemodialysis, intravenous medications, blood transfusions, tattoos, and sexually transmitted infections. The risk of transmission of these viruses through contaminated blood transfusion is much higher compared to other transmission methods. Almost 90% of people with HCV are asymptomatic and show mild symptoms. Chronic HBV carriers may have a low viral level and may even not demonstrate detectable levels of HBs Ag. Therefore, some therapeutic centers have begun to develop the use of HBV (anti-HBc) protein antibody (7).

HIV is transmitted through sexual contact, sharing HIV-infected syringes and blood transfusions. HIV infection can accelerate the natural process of infection with chronic hepatitis C and increase the risk of hepato-cellular carcinoma, Alcoholic liver disease (hepatic cirrhosis) and liver failure, leading to unsuccessful treatment of hepatitis C (8). Some studies suggest that HCV infection may also accelerate the process of AIDS. In addition, hepatitis C infection may prevent successful treatment of AIDS by increasing the incidence of hepatotoxicity associated with some antiretroviral drugs (8). Hepatitis B and C viruses are hepatic viruses and are the leading cause of chronic liver disease worldwide, especially hepatic cirrhosis and hepatocellular carcinoma.

As noted, transfusion-transmitted infections are hepatitis B, hepatitis C are HIV (9). The epidemiological prevalence of blood-borne diseases in blood donors is useful in the safety check of blood and blood products and in the assessment of the remaining risk of transfusion-transmitted infections. Therefore, studies have been conducted in this regard in different countries as well as in Iran. For example, in one study, out of a total of 310 blood donors, 12.6% were affected with at least one of HCV, HBV, and HIV conditions, while the disease prevalence for HIV, HBV and HCV was 2.6, 5.8 and 4.2%, respectively (10). It was also reported that in a 5-year period, out of 1123 blood donors, 182 were HIV positive, while the prevalence was 1.2% for HIV, 11.8% for HBV, 0.2% for HCV and

[*]**Corresponding author:** Haleh Barmaki, Department of laboratory Medicine, Faculty of Paramedical sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran. Email: Halehbarmaki1361@gmail.com Tel: +989350801929

3% for syphilis (11). In the year 2019, the prevalence of HIV, HBV, and HCV infection among 5983 blood donors in Northern Ethiopia was reported to be 2.5, 4.1 and 1.6%, respectively (12). Evaluating the prevalence of these viral infections is clinically important since it varies with geography and nationality among blood donors and directly depends on viral epidemiology in the population as a whole. A study in Semnan province showed that among 42253 blood donors, 0.062%, 0.237%, and 0.009% were affected with HBV, HCV, and HIV, respectively (13). Meanwhile, in 2016, the prevalence of HBV, HCV, and HIV in blood donors in southern Iran was 0.15, 0.1 and 0.004%, respectively (4).

The outbreak of any infection shows a wide range of changes in different parts of that region. Changes in blood donation screening strategies and the predominance of risk factors may explain these changes in the incidence of viral infection over time (14). Therefore, it is necessary to evaluate viral epidemiology in blood donors at regular intervals in order to estimate the most common risk factors and assess the effectiveness of blood safety strategies used in blood banks of the country. Defining viral epidemiology in blood donors is not only necessary to evaluate the effectiveness of blood safety strategies, but also to provide appropriate strategies to minimize the risk of transmission of these infections with blood (15). Therefore, this study was conducted to determine the prevalence of HBV, HCV and HIV infections among blood donors in Ilam province during an 11-year period from 2007 to 2017.

Methods

This retrospective study was conducted to determine the transmission of infectious diseases (HIV, HCV and AIDS), in blood donors who had referred to Ilam blood transfusion organization from 2007 to 2017 (according to the number of cases, an annual average of 13,206 individuals refer to the aforementioned). All donors have filled in consent forms and information such as age, gender, marital status, occupation (private and public employment) and the education was completed by the staff. It should be noted that the names of patients were not recorded for ethical issues. Upon collecting a total of 145273 blood samples, relevant serological tests for the screening and identification of HBV, HCV, and HIV was carried out. All positive and suspected cases of these infections were confirmed by implementing HCV Riba, HIV Blot, and HBsAg confirmation tests and were recorded as 'definitely affected" afterward.

The required information for the study was also obtained by referring to the center and received from the IT department and all data were recorded and analyzed in SPSS software. The difference was considered significant for a p value of less than 0.05.

Results

The Blood Transfusion Organization of Ilam province is the only blood transfusion center in this province, with an average of 13206 blood donations per year. In the present study, the highest frequency of donors was in 1393 and the lowest was in 1396. Statistical analysis showed that the prevalence of HBV, HCV and HIV was higher men than women (Figure 1).

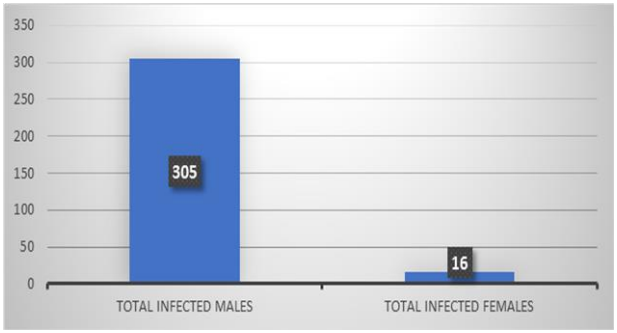


Fig. 1. Prevalence of HBV, HCV, and HIV in men and women who referred to the Blood Transfusion Center of Ilam Province from 2007 to 2017.

According to serological results of a total of 145273 patients, 249 cases were HBV-positive, 66 were HCV-positive and 6 were HIV-positive (Figure 2).

Out of 249 cases of hepatitis B, 173 were married and 76 were single, 238 were male and 11 were female; 180 had a pre-diploma, 60 had a degree within diploma and bachelors, and 9

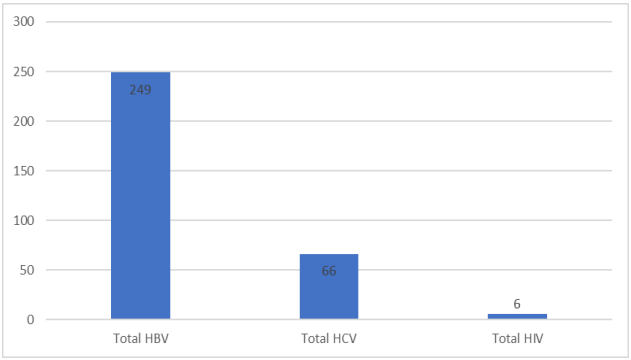


Fig. 2. Prevalence of HBV, HCV, and HIV in patients referred to Ilam Blood Transfusion Center in the years 2007-2017

had post-bachelor's degrees. In addition, 153 of the individuals with hepatitis B owned private jobs and 96 had public occupations. In patients with HBV, 89 were 20-40 years old and 160 were over 40 years of age.

In patients with hepatitis C, 66 cases were positive, 27 were married and 39 were single, 61 patients were male and 5 were female. Fifty individuals of patients with HCV had acquired a pre-diploma degree, 14 had a degree within diploma and bachelors, and 2 were had higher educational degrees. Forty-one patients were in private businesses and 25 had public occupations. Twenty-seven patients were 20-40 years old and 39 were over 40 years of age.

All 6 patients affected with AIDS were men, 4 of whom were single and 2 were married. Three patients had a pre-diploma and 3 had a degree within diploma and bachelors. Besides, all 6 individuals with a private job had AIDS, 3 of which were between 20 and 40 years old and 3 over 40 years of age. Among people with HBV, HCV and HIV, 202 were married and 119 were single (Figure 3).

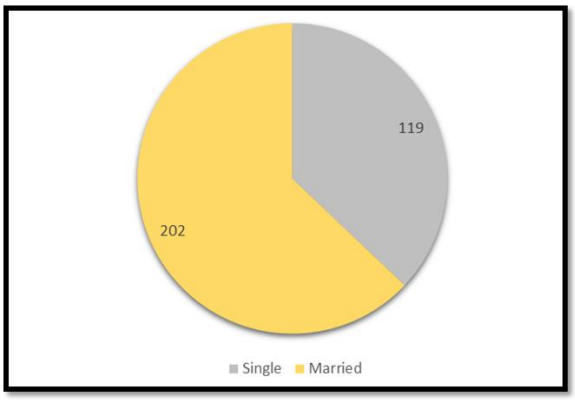


Fig. 3. Prevalence of HBV, HCV and HIV in terms of marital status.

The highest prevalence of the disease was observed in 2009 and the lowest in 2017 with 54 and 7 patients, respectively. Patients with AIDS have referred to the organization in the years 2007, 2011, 2012 and 2013 (Figure 4). Figure 5 shows the severity of these diseases separately.

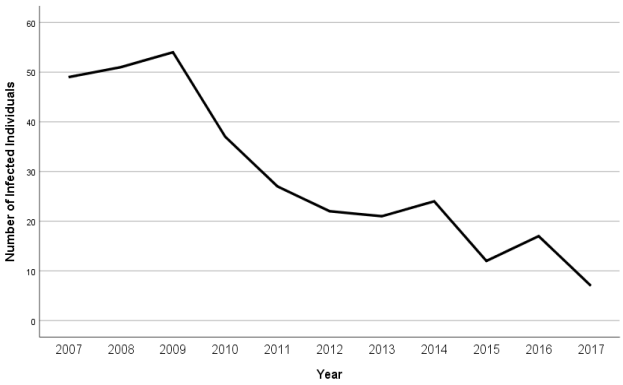


Fig. 4. Total HBV, HBC, and HIV cases reported from 2007 to 2017.

Statistical analysis (Figure 4) showed a decrease in the cumulative prevalence of HBV, HBC, and HIV cases. Also, Figure 4 shows the prevalence of each individual infections in the donors from 2007 to 2017.

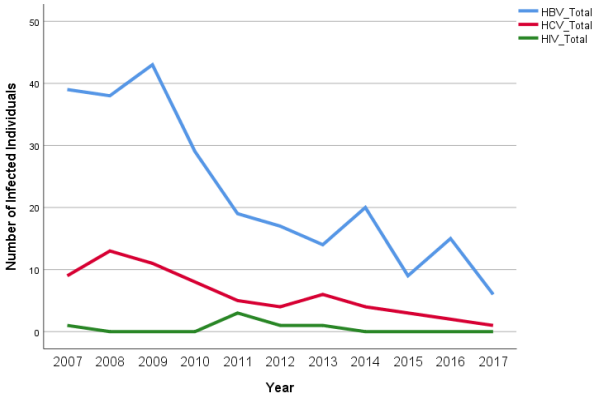


Fig. 5. Total cases of HBV, HBC, and HIV reported from 2007 to 2017 separately.

Investigation of blood donors showed that these diseases were significantly higher in men than in women ($P < 0.01$). There was a significant difference in being infected with the diseases between those with a degree lower or higher than diploma ($P < 0.0001$) and donors with a degree lower than diploma had higher rates of infection. There was no significant

difference in terms of carrying the viruses between individuals who had a degree within diploma and bachelors, and, individuals who had post-bachelor's degrees. It was also observed that having a public or private occupation does not impact the incidence of these infections, the incidence of these infections in individuals of over 40 years old was higher compared to those aged from 20 to 40 years ($P < 0.01$).

Discussion

Nowadays, around the world, due to the increasing incidence of natural and unnatural disasters, and given that Iran is a relatively prone country to the disasters, the need for facilities and equipment to collect and store blood and its products is obvious. But throughout history, from the earliest days of donating and receiving blood, there have been problems and obstacles in the perfect path to this. Among these barriers is the unwanted transfer of diseases such as hepatitis (B and C) and AIDS from the donor to the recipient, which not only does not help the patient, but also results in more suffering and more cost to the individual, family and community. So, many researchers in Iran and all over the world have conducted different studies in order to reduce the risk of transmission of these infectious diseases.

In the present study, the prevalence of blood-borne infections in the blood donors of Ilam province during the years 2007-2017 was investigated. The results of this study showed that the prevalence of hepatitis B, hepatitis C and AIDS is 0.171%, 0.045%, and 0.004%, respectively, within the studied blood donors. The evaluation of the prevalence of infections transmitted with blood and its products in terms of geographical distribution has been reported to vary in different studies (16-19)

In a study by Sajjadi et al., the incidence of HBV, HCV and HIV in volunteers referred to the Blood Transfusion Center of Kohgiluyeh and Boyer-Ahmad was evaluated on 100000 volunteers during the years 2005 to 2014. The results of this study indicated an outbreak of 0.13% for HBV and 0.06% for HCV. Though, only 3 of the blood donors were HIV positive (19). Mohsenzadeh et al. reviewed a study of 99187 blood donors in Kerman province during 2014-2015. In this study, the prevalence of HBV, HCV and HIV in donors was evaluated and the highest prevalence of HBV was reported in the city of Jiroft (0.36%), the highest HCV level in Rafsanjan city (0.1%) and the highest concomitant infection with HBV and HCV were reported in Sirjan. The results of this study on HIV in the blood donors were not statistically significant (20). In a similar study with the present study that was designed and carried out by Farshadpour et al. in the south of Iran, the prevalence of HBV, HCV and HIV infections in a ten-year period from 2004 to 2014 in 293454 blood donors was evaluated. In the study, the highest rate of prevalence belonged to HBV (0.15%) and the lowest to HIV (0.004%). Also, the prevalence of HCV among the participants was 0.1% (4). Similar studies have been carried out in other parts of Iran and had similar results (21, 22). The results of this study are in concordance with and confirm the studies conducted in other parts of Iran, in a way that the highest prevalence was related to HBV with 0.171% and the lowest prevalence was related to HIV (0.004%). Also, in the present study, a decline in the prevalence of the studied infections was noticed (Diagram 4), which had been observed in previous studies in Iran (14, 23) and other countries (18, 24, 25). However, the point that is significant and can indicate the importance of the present study and similar studies is the dispersion the difference in the prevalence of the infections in blood donors in the world and the need to identify and record the regional incidence of these infections in order to reduce them further. For example, in a study conducted by Vermeulen et al. in North Africa, there were almost completely different results with our study about the prevalence of these infections. In that study, the highest incidence rate was reported for HIV (1.3%), followed by HBV (0.66%) and HCV (0.03%) (26).

Regarding what has been done in the present study and other similar studies, two main causes of the reduction of the above-mentioned

infections in blood samples through the past decade are probably as follows:
A) Proper education of donors about their lifestyle that may affect their health, especially for those that are donating for the first time.
B) the use of advanced and reliable laboratory equipment in relation to sampling and storage.
Another important point in the study is the gender of the donors infected with these viral infections. The prevalence of these infections in men (0.249%) was significantly higher than that of women (0.07%). Regarding the sex of the blood donors that carry the studied infections, the differences observed in the results also indicate the need for comprehensive research in all geographical areas and in all blood collection centers.
In a study by Makroo et al. in northern India, a similar result was found with the results of the present study about the sex of the carriers of HBV, HCV, and HIV infection, so that in that study the rate of males was reported 3 times higher than women (27). But in a study by Vermeulen et al., the prevalence of HIV in female donors (1.4%) was higher than male donors (0.8%) (26).
In addition to the above-mentioned issues, another important criterion for choosing donors is their age. In many countries, the age range of 18-60 is permitted to donate blood (28). In the present study, using the age criterion in the calculations, this important result was obtained that the highest risk was for those over 40 years of old. Regarding the registration and evaluation of blood donors' demographic data, there was a significant difference in the level of risk of being infected with the viruses between people with educations higher than diploma and those below diploma. The prevalence of these three infections was 0.795% in subjects under the diploma, 0.074% in those between diploma and bachelor, and 0.091% in donors with higher than bachelor degree.

Conclusion

Considering all the information obtained and verifying the data obtained from this study through the implementation of similar studies and obtaining comprehensive knowledge about the risk of transmission of HBV, HCV and HIV in blood and its products, the risk of transmission of these infections can be minimized with proper planning and management.

Acknowledgment

The authors are thankful of The Blood Transfusion Organization of Ilam province for their cooperation. They also Thanks Dr. Babak Shahbaz and Dr. Ali Najafi for their constructive comments and help with preparing the manuscript and formatting the whole article.

Conflict of interests

The authors declared no conflict of interest.

Funding/Support

There is no financial support for this work.

References

1. Noubiap JJN, Joko WYA, Nansseu JRN, Tene UG, Siaka C. Seroepidemiology of human immunodeficiency virus, hepatitis B and C viruses, and syphilis infections among first-time blood donors in Edéa, Cameroon. Int J Infect Dis. 2013;17(10):832-7.
2. Esmaeili H, Hamidia Z, Hajiani G, Monkhian A, Esmaeili M, Azizzadeh M. Investigating the status of hepatitis B, C, AIDS and syphilis in blood donors in Bushehr Province in 2005. J Infect Trop Dis Iran. 2007;12(36):85-8.
3. Arshad A, Borhany M, Anwar N, Naseer I, Ansari R, Boota S, et al. Prevalence of transfusion transmissible infections in blood donors of Pakistan. BMC Hematol. 2016;16(1):27.
4. Farshadpour F, Taherkhani R, Tajbakhsh S, Gholizadeh Tangestani M, Hajiani G, Sharifi N, et al. Prevalence and Trends of Transfusion-Transmissible Viral Infections among Blood Donors in South of Iran: An Eleven-Year Retrospective Study. PLoS One. 2016;11(6): e0157615.
5. Buseri FI, Muhibi MA, Jeremiah ZA. Seroepidemiology of transfusion-transmissible infectious diseases among blood donors in Osogbo, south-west Nigeria. Blood Transfus. 2009;7(4): 293.

6. El-Hazmi MM. Prevalence of HBV, HCV, HIV-1, 2 and HTLV-I/II infections among blood donors in a teaching hospital in the Central region of Saudi Arabia. Saudi Med J. 2004;25(1):26-33.
7. Nagalo MB, Sanou M, Bisseye C, Kaboré MI, Nebie YK, Kienou K, et al. Seroprevalence of human immunodeficiency virus, hepatitis B and C viruses and syphilis among blood donors in Koudougou (Burkina Faso) in 2009. Blood Transfus. 2011;9(4):419.
8. Qian H-Z, Vermund SH, Kaslow RA, Coffey CS, Chamot E, Yang Z, et al. Co-infection with HIV and hepatitis C virus in former plasma/blood donors: challenge for patient care in rural China. AIDS. 2006;20(10):1429.
9. Khattak M, Salamat N, Bhatti F, Qureshi T. Seroprevalence of hepatitis B, C and HIV in blood donors in northern Pakistan. J Pak Med Assoc. 2002;52(9):398-402.
10. Negash M, Ayalew M, Geremew D, Workineh M. Seroprevalence and associated risk factors for HIV, Hepatitis B and C among blood Donors in South Gondar District blood Bank, Northwest Ethiopia. BMC Infect Dis. 2019;19(1):430.
11. Boushab BM, Limame OCMM, Zahra F-MF, Mamoudou S, Darnycka BMR, Saliou SM. Estimation of seroprevalence of HIV, hepatitis B and C virus and syphilis among blood donors in the hospital of Aïoun, Mauritania. Pan Afr Med J. 2017;28(1):145.
12. Tigabu A, Engda T, Mekonnen F. Seroprevalence of transfusion transmissible viral infections (HIV, HBV and HCV) among voluntary blood donors at University of Gondar Comprehensive Specialized Hospital, Gondar; Northwest Ethiopia. BMC Infect Dis. 2019;19(1):393.
13. Rezaie M, khaleghian A. Prevalence of hepatitis B, hepatitis C and HIV in blood donors in Semnan Province (Iran) from 2011 to 2015. Koomesh. 2016;17(2):501-8.
14. Pourfathollah AA. Changes in frequency of HBV, HCV, HIV and syphilis infections among blood donors in Tehran province 2005–2011. Arch Iran Med. 2014;17(9):613.
15. Khodabandehloo M, Roshani D, Sayehmiri K. Prevalence and trend of hepatitis C virus infection among blood donors in Iran: A systematic review and meta-analysis. J Res Med Sci. 2013;18(8):674.
16. Brown BJ, Oladokun RE, Ogunbosi BO, Osinusi K. Blood Transfusion-Associated HIV Infection in Children in Ibadan, Nigeria. J Int Assoc Provid AIDS Care. 2017;16(3):303-8.
17. Cappy P, Barlet V, Lucas Q, Tinard X, Pillonel J, Gross S, et al. Transfusion of HIV-infected blood products despite highly sensitive nucleic acid testing. Transfusion. 2019;59(6):2046-53.
18. Yambasu EE, Reid A, Owiti P, Manzi M, Murray MJS, Edwin AK. Hidden dangers-prevalence of blood borne pathogens, hepatitis B, C, HIV and syphilis, among blood donors in Sierra Leone in 2016: opportunities for improvement: a retrospective, cross-sectional study. Pan Afr Med J. 2018;30:44.
19. Sajjadi SM, Pourfathollah AA, Mohammadi S, Nouri B, Hassanzadeh R, Rad F. The Prevalence and Trends of Hepatitis B, Hepatitis C, and HIV among Voluntary Blood Donors in Kohgiluyeh and Boyer-Ahmad Transfusion Center, Southwestern Iran. Iran J Public Health. 2018;47(7):944-51.
20. Mohsenizadeh M, Mollaei HR, Ghaziizadeh M. Seroepidemiological Study of Hepatitis B, C and HIV among Blood Donors in Kerman. Asian Pac J Cancer Prev. 2017;18(12):3267-72.
21. Amini Kafi-abad S, Rezvan H, Abolghasemi H, Talebian A. Prevalence and trends of human immunodeficiency virus, hepatitis B virus, and hepatitis C virus among blood donors in Iran, 2004 through 2007. Transfusion. 2009;49(10):2214-20.
22. Keshvari M, Sharafi H, Alavian SM, Mehrabadi H, Zolfaghari S. Prevalence and trends of transfusion-transmitted infections among blood donors in Tehran, Iran from 2008 to 2013. Transfus Apher Sci. 2015;53(1):38-47.
23. Sharif M, Sherif A, Sayyah M. Frequency of HBV, HCV and HIV infections among hospitalized injecting drug users in Kashan. Indian J Sex Transm Dis AIDS. 2009;30(1):28-30.
24. Bhattacharya P, Chandra P-K, Datta S, Banerjee A, Chakraborty S, Rajendran K, et al. Significant increase in HBV, HCV, HIV and syphilis infections among blood donors in West Bengal, Eastern India 2004-2005: exploratory screening reveals high frequency of occult HBV infection. World J Gastroenterol. 2007;13(27): 3730-3.
25. Taye BD, Kedir R, Teshager L, Kassa T, Yeshanew AG, Aseffa A, et al. Prevalence and Associated Risk Factors of Hepatitis B and C Virus Infections among Mothers in Jimma Town, South West Ethiopia: A Community Based Study. Ethiop Med J. 2019:109-17.
26. Vermeulen M, Swanevelder R, Chowdhury D, Ingram C, Reddy R, Bloch EM, et al. Use of Blood Donor Screening to Monitor Prevalence of HIV and Hepatitis B and C Viruses, South Africa. Emerg Infect Dis. 2017;23(9):1560-3.
27. Makroo RN, Hegde V, Chowdhry M, Bhatia A, Rosamma NL. Seroprevalence of infectious markers & amp; their trends in blood donors in a

hospital based blood bank in north India. Indian J Med Res. 2015;142(3):317-22.

28. Organization WH. Blood donor selection: guidelines on assessing donor suitability for blood donation: World Health Organization. 2012.