



Detection of Blood-Borne Viruses among Blood Donors in Diyala Governorate during 2024

Ibrahim Thamer Hussien¹, Areej Atiyah Hussein², Amal Ismael Naif³

^{1,2} College of Medicine, University of Diyala, Iraq

³ Diyala Education Directorate, Baquba, Iraq

E-mail: amalismael1010@gmail.com

Article Info.

Article history:

Received 1 October 2025
Revised 2 November 2025
Accepted 26 December 2025
Published 22 January 2026

Keywords:

Hepatitis B virus, Hepatitis C virus, human immunodeficiency, ELISA, epidemiology.

How to cite:

Ibrahim Thamer Hussien, Areej Atiyah Hussein, Amal Ismael Naif, Detection of Blood-Borne Viruses among Blood Donors in Diyala Governorate during 2024. Aca. Intl. J. Med. Sci. 2026; 4 (1) 01-07.

DOI: <https://doi.org/10.59675/M411>

Copyright:

This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0)

Abstract

Blood-borne viruses are viruses that some people carry in their blood and can be spread from one person to another. Those infected with blood-borne viruses may show little or no symptoms of serious disease, while others may be severely ill. A screening test is used to detect potential health disorders or diseases in people without symptoms. The goal is early detection and lifestyle changes or surveillance to reduce the risk of disease or detect it early enough to treat it most effectively. **Aim:** To determine the blood viral infection among blood donors in Diyala governorate during 2024. **Methods:** A cross-sectional study was conducted at the Blood Bank of Baqubah Teaching Hospital from January to December 2024 in Diyala Governorate. A seroepidemiologic survey about hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) infection using Elisa for qualitative detection of each virus. **Results:** The rate of blood viral infection among blood donors was 2.45% during 2024. High percentages of HBV, 2.31% (662 cases), were noticed in this study,

followed by HCV and HIV, 0.08% (25 cases) and 0.04% (14 cases), respectively. Infection in males more than females, and most positive cases were reported in the age group 31-45 years, 356 (53.78%) for HBV, 15(60%) for HCV, and 6 (42.85%) for HIV. There were differences in patient accommodations between Baqubah and its surrounding areas for each virus. Hepatitis B virus cases are distributed consistently throughout the year, with the highest prevalence in March (89, 13.44%) and May (78, 11.78%). Hepatitis C virus shows a relatively stable, low prevalence across months, peaking slightly on 5 January (20%) and 5 August (20%). Human immunodeficiency virus cases remain consistently rare, with minor spikes on 6 August (42.86%) and 2 October (14.30%). **Conclusion:** The proportion of viral infections among blood donors remained high; further studies are recommended to monitor infection rates.

Introduction

Hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) are serious worldwide health issues [1]. Globally, an estimated 200 million people have an HCV infection, and 350 million people have a chronic HBV infection [2]. Infection may be linked to a higher death rate because these viruses may raise the risk of developing major liver illnesses, such

as cirrhosis, liver failure, and hepatocellular carcinoma (HCC) [3]. The main ways for HBV and HCV transmission are direct contact with blood, intravenous injections, transfusions of blood and blood products, and unprotected intercourse [4]. Nonetheless, blood transfusion and blood transfusion by-products have a known tendency to make one susceptible to the contraction of HBV and HCV [5]. Thousands of lives are saved, and morbidity is reduced because of a non-alternative lifesaving treatment every year [6]. To address this problem and reduce the transmission of these infections, the World Health Organisation (WHO) recommended systematic serological testing for transfusion-transmissible infections (TTIs), including HBV and HCV [7]. The results of donors' tests can be viewed as an indicator of a safe blood supply [8]. It was also used to determine HBV and HCV incidence among blood donors, helping medical personnel understand the epidemiology of these diseases in the community [9]. The prevalence of HBV and HCV greatly decreased as soon as the blood donor predonation screening system was implemented [10]. Moreover, following the information about the modes of spreading HBV and HCV, the donors became more conscious of the necessity to avoid risk factors [11]. Also, since the inception of the HBV vaccination, HBV prevalence in the general population has declined throughout the world, especially in the youth [12]. This has been particularly low among children who are under 14 years old due to the integration of HBV vaccine into the national immunisation schedule [13].

Human immunodeficiency virus is one of the worst pandemics in human history, having killed 39 million people to date and infected 70 million. Given the substantial danger of HIV transmission through blood transfusions, WHO guidelines require that blood products be screened for viral infections [14]. Depending on several factors, including the incidence of HIV, public awareness campaigns about blood donation, pre-donation screening, and donor selection, the prevalence of HIV among blood donors varies by region and nation [15].

Aim: To determine the blood viral infection among blood donors in Diyala governorate during 2024.

Methodology

Cross sectional study used descriptive statistics was conducted in the Blood Bunk in Baubah Teaching Hospital during the period between January to December 2024 in Diyala Governorate, Taking into account the ethics of collecting blood bank samples, including informed consent, confidentiality, respect for the donor's autonomy, and including ensuring the donor understands the purpose of use, protecting their data, withdrawing only the required amount, and handling samples and waste safely to ensure everyone's safety.

A seroepidemiologic survey about hepatitis B virus and hepatitis C virus infection was carried out in several groups comprising 85 patients, who were divided into several groups: 42 patients, hemodialysis, 25 patients, thalassemia, 14 patients, and 4 patients with cancer, ranging in age from 1 month to 60 years. Diagnosed using enzyme linked immunosorbent assay for qualitative detection of Hepatitis B surface antigen (HBsAg) in human serum or plasma (REF-BXE0781C, LOT-CV-2310-6, Abbott Ireland), HCV 4th generation - enzyme linked immunosorbent assay for qualitative detection of antibodies to HCV in human serum or plasma (REF-BXE0741C, LOT-BS-2310-4, Abbott Ireland) and HIV 4th generation (Ag/Ab) enzyme linked immunosorbent assay for qualitative detection of antibodies to human immunodeficiency virus type-1, 2 in human serum or plasma (REF-BXE0792C, LOT-HAA-2310-2, Abbott Ireland).

Results:

The rate of blood-borne viral infection among blood donors was 2.45% (701 out of 28.546) in Diyala Governorate during 2024. High percentages of HBV, 2.31% (662 cases), were noticed in this study, followed by HCV and HIV, 0.08% (25 cases) and 0.04% (14 cases), respectively, as shown in Figure

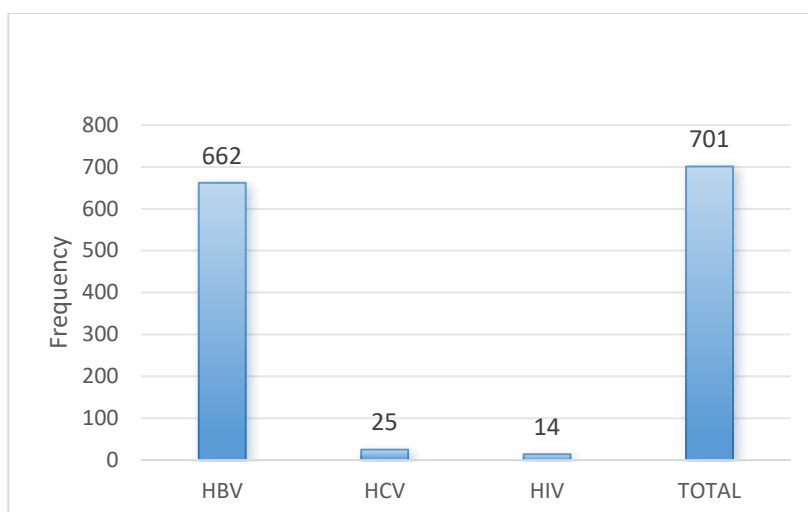


Figure 1. Distribution of blood-borne viruses among the study population

The distribution of Hepatitis B, C, and HIV infections among a total sample of 701 individuals, stratified by gender. Hepatitis B was reported in 413 cases (62.40%) among males; Hepatitis C was observed in more than 15 cases (60%) among males, while an equal percentage was noticed among HIV cases, as shown in Table 2.

Table 2: Distribution of Infection Types Hepatitis B Virus, Hepatitis C Virus, and Human immunodeficiency virus by gender.

Gender		Type infection No. (%)		
		HBV	HCV	HIV
Female	Count & (%)	249(37.60%)	10(40%)	7(50%)
Male	Count & (%)	413(62.40%)	15(60%)	7(50%)
Total	Count & (%)	662(100%)	25(100%)	14(100%)

Highlights the distribution of Hepatitis B and C infections, and HIV among different age groups. Most cases were recorded among the age group 31-45 years old, HBV accounts for 356 (53.78%), HCV for 15(60%), and HIV for 6(42.85%). While a low percentage was recorded in the age groups 15-30 and 46-60 years, as shown in Table 3.

Table 3: Distribution of Infection Types Hepatitis B Virus, Hepatitis C Virus, and Human immunodeficiency virus by Age Group.

Age group Years	Type infection No. (%)		
	HBV	HCV	HIV
15-30	160(24.17%)	7(28%)	3(21.43%)
31-45	356(53.78%)	15(60%)	6(42.85%)
46-60	146(22.05%)	3(12%)	5(35.72%)
Total	662(100%)	25(100%)	14(100%)

The prevalence of Hepatitis B, C infections, and HIV in Baqubah and the surrounding areas. Most HBC, HCV cases are reported around Baqubah areas, HBV accounts for 46.8% of the total, HCV for 1.6%, and HIV for 1.0%. While in Baqubah, HBV represents 47.6% of the total, HCV 2.0%, and HIV 1.0%, as shown in Table 4.

Table 4: Distribution of Infection Types Hepatitis B Virus, Hepatitis C Virus, and Human immunodeficiency virus by Location.

location	Type infection No. (%)		
	HBV	HCV	HIV
Baqubah	328(49.55%)	11(44%)	7(50%)

Around Baqubah	334(50.45%)	14(56%)	7(50%)
Total	662(100%)	25(100%)	14(100%)

Outlines the monthly distribution of hepatitis B virus, hepatitis C virus, and HIV infections. Hepatitis B virus cases are distributed consistently throughout the year, with the highest prevalence in March 89(13.44%) and May 78(11.78%). Hepatitis C virus shows a relatively stable low prevalence across months, peaking slightly on January 5(20%) and August 5(20%). Human immunodeficiency virus cases remain consistently rare, with minor spikes on August 6(42.86%) and October 2(14.30%).

Table 5: Distribution of HBV, HCV, and HIV among the study population during 2024.

Months	Viral infection		
	HBV	HCV	HIV
January	43(6.50%)	5(20%)	1(7.14%)
February	58(8.76%)	4(16%)	0
March	89(13.44%)	2(8%)	1(7.14%)
April	44(6.65%)	2(8%)	1(7.14%)
May	78(11.78%)	1(4%)	1(7.14%)
June	40(6.04%)	3(%)	0
July	70(10.57%)	0	1(7.14%)
August	28(4.25%)	5(20%)	6(42.86%)
September	38(5.74%)	1(4%)	0%
October	48(7.25%)	0	2(14.30%)
November	56(8.45%)	2(8%)	1(7.14%)
December	70(10.57%)	0	0
Total	662(100%)	25(100%)	14(100%)

Discussion

This paper indicates that HBV is the commonest transfusion-transmissible infection in blood donors in the Diyala governorate, with a prevalence rate of 2.31 as compared to HCV and HIV with prevalence rates of 0.08 and 0.04, respectively. These results show that HBV still represents a higher threat to the safety of blood than the rest of the viral infections in the population under study.

The incidence of HBV in this research is also higher compared to that of Mohammed et al. (2023), who revealed 0.78 percent of HBV and 0.14 percent of HCV in blood donors in Baghdad, and 1.14 percent and 0.11 percent in Basra, respectively [16,17]. On the same note, Hussein (2018) also noted a lower prevalence rate of 1.14% of HBV among the blood donors in Duhok city [18]. Nevertheless, the present results are significantly lower compared to a different study that was carried in Diyala governorate and reported much higher prevalence rates of 13.82% of HBV, 9.25% of HCV, and 0.61% of HIV [19]. Such differences can be explained by the dissimilarity in study design, population, screening methods, and inclusion of the high-risk groups in some of the studies.

Biological features of the virus might explain the increased prevalence of HBV over HCV and HIV. HBV can survive outside the body of the human being for at least seven days and be infectious, which means that there is a high chance of transmission [20]. Moreover, the issue of HBV is complex, and its development is determined by a complex interaction of behavioral, environmental, and host-related factors that differ in their populations and regions [21]. HBV is currently one of the most prevalent viral infections in the world because it can be spread through various channels, such as contact with infected body fluids and blood, during sex and sharing needles, and mother-to-child infection during childbirth. Moreover, the long duration of the consequences of the disease is a result of chronic infection that is usually acquired in early childhood.

Gender distribution analysis showed that HBV and HCV infections were higher in males than in females (62.40 percent and 60 percent, respectively), whereas the HIV infection was evenly distributed between males and females. These are similar to Mohammed et al. (2023) and Hussein et al. (2018); both of them reported that the prevalence of HBV among male donors is much higher. This could be explained by the influence of sociocultural factors because male donors are more likely to donate blood than their female counterparts. Moreover, women are not usually included in donations during pregnancy, after childbirth, and while breastfeeding, and have a higher chance of developing iron deficiency anemia. Occupational exposure and lifestyle-related risk factors, as well as reduced vaccination coverage in men, can also serve as additional factors in increased infection rates in men.

Age-based analysis revealed that HBV and HCV were greatest among people between the ages of 31-45 years, and then among the people between the ages of 15-30 years and the people between the ages of 46-65 years. The age group with the highest HIV infection was also the 31-45 years. The findings indicate that the risk of viral infection is greatest among middle-aged adults, which could be due to greater occupational and social activity as well as cumulative risk over time. The same age-related trends have been described in the literature [16,22-24]. These findings demonstrate the significance of focused screening and vaccination of HBV among people in their third and fourth decades of life.

When comparing geographically between Baqubah and the surrounding regions, HBV and HCV were found to be the cause of 50.45 percent and 56 percent of infections, respectively, and there was no difference in HIV prevalence in the two regions. These results coincide with the results provided by Al-Mahdawi et al. (2022), who discovered that HBV is the most prevalent transfusion-transmissible infection among blood donors in Diyala governorate [25]. The minor predominance in rural regions could be due to the variations in the accessibility of medical services and screening activities, but the uniform distribution of HIV by regions indicates similar transmission-related risk factors, such as medical practice, awareness, and lifestyles.

The seasonal analysis showed that there was a relative steadiness in the HBV prevalence during the year, with the highest rates recorded in March (13.44%) and May (11.78%). The HCV prevalence was constantly low with slight peaks in January and August, whereas HIV cases were more frequent in August and October. These data are consistent with Mohammed et al. (2022), who have reported higher HBV infections in spring or early summer months among the Iraqi blood donors [17]. Seasonal changes can be due to more social contacts, medical visits, or environmental changes that influence the dynamics of transmission. The reported variations in HIV prevalence are consistent with the past reports that HIV patterns closely follow the general epidemiological trends, but not the seasonal influences. The findings emphasise the need to constantly screen and implement long-term public health interventions to control the spread of viruses.

Limitations of the Study

This study has several limitations. Screening for blood-borne viral infections was performed using third-generation ELISA assays, which detect viral antigens or antibodies but may fail to identify infections during the window period, potentially leading to an underestimation of true prevalence. Confirmatory molecular testing, such as polymerase chain reaction (PCR), was not conducted due to resource limitations. In addition, the study relied on routinely collected blood donor data, and detailed information on behavioral, occupational, and vaccination-related risk factors was not

available, limiting the ability to assess associations between infection status and specific risk factors. Furthermore, as the study was conducted within a single governorate during 2024, the findings may not be fully generalisable to other regions.

Despite these limitations, the study provides valuable insight into the epidemiology of transfusion-transmissible viral infections among blood donors in Diyala governorate and highlights the ongoing need for enhanced screening, vaccination, and public health strategies to ensure blood safety.

Conclusion:

The proportion of viral infection among blood donations was still high in Diyala governorate. Addressing seasonal peaks of HBV: The aforementioned months (March and May) are considered HBV months, as the prevalence of HBV is higher at this time.

Recommendations:

1. Increased efforts in HBV Vaccination, particularly in high-risk groups such as males and people aged 31–45 years
2. Educational initiatives must be carried out to increase awareness about blood-borne viruses' transmission, risk factors, and early screening, especially in areas with a high prevalence.
3. Increase personal hygiene and preventive healthcare.
4. Equitable access to care in both urban and rural settings is critical for regular screening, treatment, and prevention of viral infections.
5. Determine the factors causing seasonal peaks, which will help in better coverage of preventive measures during high-risk months.

References

1. Flichman DM, Blejer JL, Livellara BI, Re VE, Bartoli S, Bustos JA, et al. Prevalence and trends of markers of hepatitis B virus, hepatitis C virus and human immunodeficiency virus in Argentine blood donors. *BMC Infect Dis.* 2014; 14:218.
2. Zaheer H, Saeed U, Waheed Y, Karimi S, Waheed U. Prevalence and trends of hepatitis B, hepatitis C and human immunodeficiency viruses among blood donors in Islamabad, Pakistan, 2005–2013. *J Blood Disord Transfus.* 2014; 5:217.
3. Walter SR, Thein HH, Amin J, Gidding HF, Ward K, Law MG, et al. Trends in mortality after diagnosis of hepatitis B or C infection, 1992–2006. *J Hepatol.* 2011;54(5):879–886.
4. Andrade AF, Oliveira-Silva M, Silva SG, Motta IJ, Bonvicino CR. Seroprevalence of hepatitis B and C virus markers among blood donors in Rio de Janeiro, Brazil, 1998–2005. *Mem Inst Oswaldo Cruz.* 2006;101(6):673–676.
5. Uneke CJ, Ogbu O, Inyama PU, Anyanwu GI, Njoku MO, Idoko JH. Prevalence of hepatitis B surface antigen among blood donors and human immunodeficiency virus-infected patients in Jos, Nigeria. *Mem Inst Oswaldo Cruz.* 2005;100(1):13–16.
6. Lavanya V, Viswanathan T, Malar SAS, Malarvizhi A, Moorthy K. Prevalence of hepatitis B virus infection among blood donors with antibodies to hepatitis B core antigen. *Int J Med Med Sci.* 2012;4(6):128–137.
7. Kafi-Abad SA, 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, 2004–2007. *Transfusion.* 2009;49(10):2214–2220.
8. Vogt M, Lang T, Frösner G, Klingler C, Sendl AF, Zeller A, et al. Prevalence and clinical outcome of hepatitis C infection in children who underwent cardiac surgery before the implementation of blood-donor screening. *N Engl J Med.* 1999;341(12):866–870.

9. Gurol E, Saban C, Oral O, Cigdem A, Armagan A. Trends in hepatitis B and hepatitis C virus among blood donors over 16 years in Turkey. *Eur J Epidemiol.* 2006;21(4):299–305.
10. Mast EE, Margolis HS, Fiore AE, Brink EW, Goldstein ST, Wang SA, et al. A comprehensive immunisation strategy to eliminate transmission of hepatitis B virus infection in the United States: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep.* 2005;54(RR-16):1–31.
11. Liang X, Bi S, Yang W, Wang L, Cui G, Cui F, et al. Epidemiological serosurvey of hepatitis B in China: declining HBV prevalence due to hepatitis B vaccination. *Vaccine.* 2009;27(47):6550–6557.
12. Liang X, Bi S, Yang W, Wang L, Cui G, Cui F, et al. Evaluation of the impact of hepatitis B vaccination among children born during 1992–2005 in China. *J Infect Dis.* 2009;200(1):39–47.
13. Shepard CW, Simard EP, Finelli L, Fiore AE, Bell BP. Hepatitis B virus infection: epidemiology and vaccination. *Epidemiol Rev.* 2006; 28:112–125.
14. Moore MS, Bocour A, Tran OC, Qiao B, Schymura MJ, Laraque F, et al. Effect of hepatocellular carcinoma on mortality among individuals with hepatitis B or hepatitis C infection in New York City, 2001–2012. *Open Forum Infect Dis.* 2018;5(2): ofy016.
15. Jung G, Olivas P, Díaz A, Lens S. Hepatitis E-induced acute-on-chronic liver failure and VI nerve paralysis. *Liver Int.* 2018;38(9):1696–1697.
16. Kadhim SJ, Kadhim NJ, Ali MR, Ogaili RH, Wahid Saleh YA, Mohammed RQ. Hepatitis B and Hepatitis C virus prevalence among Iraqi blood donors. *Microbes & Infectious Diseases.* 2025 Nov 1;6(4).
17. Mohammed KAS, Hameed MM, Mousa AH, Saleh AT. Prevalence and trends of transfusion-transmissible infections among blood donors in Basra, Iraq. *BMJ Open Gastroenterol.* 2023;10:e000968.
18. Hussein NR. Risk factors of hepatitis B virus infection among blood donors in Duhok City, Kurdistan Region, Iraq. *Caspian J Intern Med.* 2018;9(1):22–26.
19. Ali HE, Hussein AA, Hadi LM. Association between HBV, HCV, HIV and ABO blood groups among blood donors in Baqubah City, Iraq. *Indian J Forensic Med Toxicol.* 2021;15(3):4680–4687.
20. Kasper DL, Fauci AS, Hauser SL, Longo DL, Jameson JL, Loscalzo J. *Harrison's principles of internal medicine.* 20th ed. New York: McGraw-Hill; 2018. p. 360.
21. Tarky AM, Akram W, Al-Naaimi AS, Omer AR. Epidemiology of viral hepatitis B and C in Iraq: a national survey 2005–2006. *Zanco J Med Sci.* 2013;17(1):370–380.
22. Hussein AA, Motib AS, Hadi LM. Evaluation of ELISA and HBsAg rapid test cassette assay in detection of hepatitis B virus. *J Pharm Sci Res.* 2018;10(12):3157–3159.
23. Al-Rubaye A, Tariq Z, Alrubaiy L. Prevalence of hepatitis B seromarkers and hepatitis C antibodies in blood donors in Basra, Iraq. *BMJ Open Gastroenterol.* 2016;3(1):e000067.
24. Mo PY, Jin F, Li D, Zou W, Zhong J, Tong Z, et al. Prevalence and molecular characteristics of occult hepatitis B virus infection among blood donors in Huzhou City, eastern China. *Gene.* 2024; 927:148718.
25. AL-Mahdawi FK, Mohammed MR, Mahmood MM. Screening tests for voluntarily donated blood in Diyala governorate. In *AIP Conference Proceedings 2022 Oct 25 (Vol. 2398, No. 1, p. 040030).* AIP Publishing LLC.

