

**Deanship of Graduate Studies
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**Prevalence and Risk Factors of Bloodborne Diseases Among Blood
Donors in the West Bank (2020–2024)**

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Donors in the West Bank (2020–2024)**

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Thesis approval

**Prevalence and Risk Factors of Bloodborne Diseases Among Blood Donors in
the West Bank (2020–2024)**

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Dedication

I dedicate this study to everyone who believed in me and supported me throughout this academic journey.

I want to thank Dr. Asad Ramlawi in particular for always believing in me and supporting me. His advice and encouragement were crucial in completing this work.

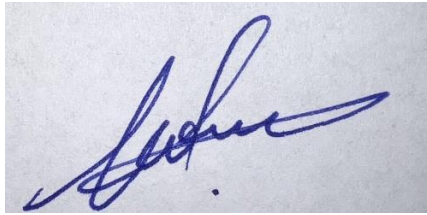
I also dedicate this to my family and friends for always being there for me and providing the support I need to keep going. This journey would not have been possible or meaningful without you.

Nour Hassan Mohammad Al-Nawawreh

Declaration

Unless otherwise stated, I certify that the thesis I submitted for the master's degree in Prevention and Control of Infectious Disease at Al-Quds University is the product of my research and that this work has not previously been submitted to another university for a higher degree.

Signature:

A handwritten signature in blue ink, appearing to be 'S. Al-Quds', written on a light-colored background.

Date: **09/08/2025**

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Abstract:

Background: Blood banks are essential components of the health care system, and patients needing blood transfusions rely on blood donors. However, blood can carry risks for donors, families, recipients, and the community. Bloodborne diseases such as hepatitis B, C, HIV, and syphilis are among the common infections transmitted through various methods. These infections often do not show symptoms in donors, making them a hidden threat to recipients and public health. blood-borne diseases are a significant concern when it comes to blood transfusions. Because of that, blood banks and health departments often do screenings to catch any infections early. Every year, millions of people globally face the risk of catching infections that can be spread through blood transfusions. However, there is limited research on the prevalence of these conditions among blood donors in Palestine.

Methodology: A retrospective cohort study was conducted at the Governmental Preventive Medicine Department (PMD) in the West Bank, Palestine, from 2020 to 2024, to assess the prevalence of blood-borne diseases among blood donors and analyze associated risk factors.

Result: From 2020 to 2024, a total of 259,998 blood donors were screened, of whom 808 (0.31%) tested positive for blood-borne infections. The prevalence rates were 0.025% for HBV, 0.0053% for HCV, 0.006% for HIV, and 0% for syphilis. HBV was the most common infection (81% of cases), followed by HCV (17%) and HIV (2%). Male donors and those residing in urban areas were more likely to be infected. The most affected age group for HBV was 34–41 years, while for both HCV and HIV, it was 26–33 years. Statistical analysis revealed a significant association between infection type and both age group ($p < 0.001$) and sex ($p = 0.003$). Notably, unprotected sexual contact accounted for 94% of HIV cases, and HBV vaccination coverage among donors remained low at 13.3%.

Conclusion: The study showed that blood donors in the West Bank had unexpectedly low rates of HBV, HCV, and HIV, with no reported cases of syphilis. Notably, men, urban residents, and middle-aged donors were more likely to carry infections. The main modes of transmission for these diseases appear to be through unsafe blood transfusion practices and unprotected sexual activity. Overall, there is room for improvement in vaccination coverage for adults over 33 years of age, safety procedure enhancements, and regular follow-up checks to ensure long-term safety.

Keywords: Blood-borne Diseases, Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Human Immunodeficiency Virus (HIV), Syphilis, Blood Donors, Prevalence, Risk Factors.

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List of abbreviations

Initials of the term	Term in English
CDC	The Centers for Disease Control
WHO	World Health Organization
MOH	Ministry of Health
TTIs	transfusion-transmissible infections
BBs	Blood banks
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HIV	Human immunodeficiency virus
VDRL	Venereal Disease Research Laboratory test
BBDs	Bloodborne diseases
NACO	National AIDS Control Organization
NABH	National Accreditation Board for Hospitals and Healthcare Providers
PMD	Preventive Medicine Department
NAT	Nucleic Acid Testing
EMRO	Eastern Mediterranean Regional Office (of WHO)
IV	Intravenous
IVD	Intravenous Drug Use
MSM	Men who have Sex with Men
STI	Sexually Transmitted Infection
HCC	Hepatocellular Carcinoma
ID-NAT	Individual Donation-Nucleic Acid Testing
UNRWA	United Nations Relief and Works Agency for Palestine Refugees

HTLV	Human T-lymphotropic Virus
RPR	Rapid Plasma Reagin
PWID	People Who Inject Drugs

Chapter One

1. Introduction

Blood banks (BBs) play a critical role in healthcare systems worldwide, playing a vital role in patient care and in saving lives (Abebe et al., 2020). Blood and its components, such as fresh-frozen plasma and platelets, are used extensively to treat various medical conditions and to save millions of lives every year. Additionally, they prolong the lives of those with potentially fatal diseases and enable complex medical and surgical procedures to occur (WHO, 2010). Blood transfusions can save millions of lives; however, they carry many risks, particularly the transmission of contaminated blood with blood-borne diseases (Siraj et al., 2018).

Hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and syphilis are among the most critical bloodborne diseases. These infections represent a significant public health challenge, particularly in regions with high rates of blood donation (Boslaugh, 2016). The global burden of bloodborne viruses—especially HBV and HCV—remains substantial, with evidence suggesting persistent transmission in many regions. These diseases are transmitted through various routes, including transfusion of infected blood from donors, sexual contact with infected individuals, sharing of contaminated needles, intravenous drug use, and vertical transmission from mother to child. Globally, they contribute to considerable morbidity and mortality (Nwankwo et al., 2012). Viral hepatitis is estimated to cause approximately 1.34 million deaths annually. Each year, up to 16 million HBV infections and 5 million HCV infections are attributed to blood transfusions (Abebe et al., 2020). These infections can result in severe long-term outcomes, including chronic liver disease, immunosuppression, and premature death (Saeed & Waheed, 2023).

Blood-borne infections in asymptomatic donors are a major contributor to transfusion-related transmission. Because these infections often remain undetected in otherwise healthy-appearing individuals, they pose a hidden threat to blood recipients and may also facilitate wider community spread. This highlights the critical need for comprehensive screening protocols in blood banks and preventive health initiatives. Effective screening safeguards the blood supply, enables early diagnosis, curbs further transmission, and protects public health. However, millions worldwide—especially in low- and middle-income countries where routine screening is not consistently available—remain vulnerable to transfusion-transmissible infections (TTIs) (Ataro et al., 2018).

According to the World Health Organization (WHO, 2023), approximately 118.5 million people donate blood each year worldwide. A growing proportion of these donations comes from voluntary, unpaid donors, reflecting an encouraging global trend. The demand for blood and blood products continues to rise annually, particularly in low- and middle-income countries. In high-income countries, the donation rate is about 33 per 1,000 population; in upper-middle-income countries, it is 15.1 per 1,000; in lower-middle-income countries, 8.1

per 1,000; and in low-income countries, just 4.4 per 1,000 (WHO, 2015b). However, in many regions, reliance on family/replacement donors or paid donors persists, which increases the risk of transfusion-transmissible infections (TTIs). Reported prevalence rates among blood donors vary widely: HIV (0.003%–1.08%), HBV (0.03%–3.70%), HCV (0.02%–1.03%), and syphilis (0.05%–0.90%) (WHO, 2023). These infections are generally less common in high-income countries, whereas in low- and middle-income countries, inadequate screening measures contribute to higher TTI rates in the blood supply (WHO, 2023).

To reduce these risks, international organizations such as WHO, along with national bodies like the National AIDS Control Organization (NACO) and the National Accreditation Board for Hospitals and Healthcare Providers (NABH), have established clear standards for infection control and quality assurance in blood banks. These standards emphasize thorough donor screening, regular testing of blood products, and maintaining hygienic environments (Asirvatham et al., 2021). In some developing countries, the lack of routine serological testing of donors has facilitated the transmission of HBV and HCV to recipients. WHO recommends that all donated blood undergo rigorous screening for TTIs using quality-assured procedures before transfusion, as part of a comprehensive strategy to ensure blood safety (Mohammed et al., 2023).

Blood donation plays an important role in healthcare across Palestine, especially in the West Bank. However, there is not much research on how common BBDs are among blood donors in this area. To make blood donation safer, it is essential to know how common BBDs are in blood donors and the associated risk factors. The demographics of blood donors, including their age, gender, where they live, and what they do, along with medical history and behaviors like past medical treatments, IV drug use, or unprotected sex, can influence the likelihood of bloodborne infection. Knowing these factors helps us develop better screening methods to prevent the spread of infections through blood transfusions.

1.1 Problem Statement

Blood donation plays a vital role in healthcare systems. However, the lack of data on the prevalence and risk factors of bloodborne diseases (BBDs) among donors in the West Bank poses a significant threat to donors, recipients, their families, and the wider community. Infections such as hepatitis B, hepatitis C, HIV, and syphilis represent serious public health concerns because they can remain undetected for long periods and spread silently between individuals. To date, no studies have been conducted in the West Bank to assess the prevalence and associated risk factors of BBDs among blood donors. Without robust epidemiological data, it is difficult to identify high-risk individuals or to design and implement targeted interventions.

Risk factors for BBDs include sociodemographic characteristics (e.g., age, gender, place of residence, occupation), behavioral factors (e.g., unprotected sexual activity, tattooing, injection drug use), and medical history (e.g., previous blood transfusions). These factors contribute to the transmission of infections and are compounded by limited public awareness about their risks. Because blood donors may carry infections without displaying symptoms, there is a possibility of unknowingly transmitting these diseases to recipients.

This study aims to understand better the prevalence of blood-borne diseases and the associated risk factors in the West Bank between 2020 and 2024. The findings will provide policymakers with critical evidence to inform blood safety policies, reduce the risk of

community transmission, and guide targeted public health initiatives to protect both donors and recipients, as well as their families and communities.

1.2 Significance and justification

This study is important as it examines trends in the prevalence of bloodborne diseases (BBDs) over time and identifies associated risk factors among blood donors in the West Bank. Blood transfusions are critical for the treatment of many medical conditions. However, they can transmit infections such as HIV, hepatitis B, hepatitis C, or syphilis if donor blood is not adequately screened. While blood donation is a vital act that benefits recipients, undetected infections in donors can compromise transfusion safety. In some cases, the donation process may also serve as an opportunity to detect infections early, allowing for timely intervention and reducing the likelihood of disease transmission.

The primary aim of this study is to provide evidence that will strengthen blood safety measures, improve screening protocols, and guide public health policy. By determining the prevalence of BBDs, this research can support efforts to reduce infection rates in the region. The findings will help healthcare professionals and policymakers identify high-risk groups and better understand behaviors that contribute to disease spread, enabling the design of targeted prevention strategies. For instance, if unprotected sexual activity or intravenous drug use is found to be common among infected donors, tailored interventions can be developed to address these specific behaviors. Understanding the demographic, medical, and behavioral characteristics of infected donors will allow blood banks to refine screening processes and enhance transfusion safety.

Although blood-borne diseases have been widely studied in other parts of the world, limited data exist for Palestine, notably the West Bank. The scarcity of region-specific evidence makes it difficult to assess local factors influencing the spread of these infections. This study seeks to address this gap by investigating the prevalence of common BBDs and associated risk factors among blood donors in the West Bank from 2020 to 2024. The results will contribute to the global knowledge base and inform strategies to improve the safety and effectiveness of blood donation services in Palestine.

1.3 Study aims

This study aims to assess the prevalence of bloodborne diseases, specifically hepatitis C, hepatitis B, syphilis, and HIV, among blood donors in the West Bank between 2020 and 2024, and to identify the risk factors contributing to these diseases among blood donors during this period.

1.4 Research Objectives

- 1- To determine the prevalence of bloodborne diseases, specifically HBV, HCV, syphilis, and HIV, among blood donors in the West Bank from 2020 to 2024.
- 2- To determine the demographic, behavioral, and medical factors contributing to the prevalence of HBV, HCV, HIV, and syphilis among blood donors in the West Bank.
- 3- To examine the effectiveness of post-donation follow-up and case management for donors diagnosed with bloodborne infections in the West Bank.

1.5 Research questions

- 1- What is the prevalence of bloodborne diseases (HBV, HCV, HIV, and syphilis) among blood donors in the West Bank from 2020 to 2024?
- 2- Which demographic characteristics—such as age, gender, occupation, and residence—are associated with the prevalence of syphilis, HIV, HBV, and HCV among West Bank blood donors?
- 3- Which medical and behavioral risk factors—such as intravenous drug use, unprotected sexual activity, tattooing, or a history of medical procedures—are associated with a higher likelihood of bloodborne infections among donors?
- 4- How effective are post-donation follow-up and case management procedures for donors diagnosed with bloodborne infections in the West Bank?

1.6 Conceptual definition

- Donor with HIV, HCV, HBV, or Syphilis: A blood donor who tests reactive for at least one transfusion-transmissible infection, including hepatitis B surface antigen (HBV), hepatitis C virus antibodies (HCV), human immunodeficiency virus antibodies (HIV), or reactive treponemal/non-treponemal tests for *Treponema pallidum* (syphilis), indicating either current infection or serological evidence of prior exposure.
- Sociodemographic Factors: Characteristics such as age, sex, occupation, marital status, and place of residence, which may influence an individual's level of exposure to health risks, healthcare-seeking behavior, and accessibility to medical services.
- Behavioral Factors: Lifestyle practices that increase the likelihood of exposure to bloodborne pathogens, including unprotected sexual intercourse, intravenous drug use, and tattooing with inadequately sterilized instruments.
- Medical Factors: Invasive medical interventions such as blood transfusions, surgical procedures, endoscopic examinations, and dental treatments that may compromise the integrity of the skin or mucous membranes, facilitating the entry of infectious agents into the body.

Chapter Two

2. Literature Review

This chapter reviews the existing literature on the prevalence of blood-borne diseases among blood donors. It discusses the main factors that increase the risk and outlines measures to prevent them. The focus is on hepatitis B, hepatitis C, HIV, and syphilis. In Palestine and the West Bank, there is not much research available. This review primarily examines studies from other low- and middle-income countries with similar healthcare systems or economic situations.

The goal of this literature review is to demonstrate how transfusion-transmissible infections (TTIs) are managed globally, including common demographic, behavioral, and medical risk factors, and to examine the methods used for blood donor screening worldwide. Given the lack of local research and data in Palestine, conducting more studies is crucial to improve blood quality and for the early detection of bloodborne diseases.

Hepatitis B and C, HIV, and syphilis remain significant public health concerns in maintaining a safe blood supply worldwide. Numerous studies have explored the prevalence of these infections and the risk factors that contribute to transmission among both the general population and blood donors. It is therefore crucial to generate evidence specific to blood donors to understand their risk profile better. Factors such as access to healthcare, education, hygiene practices, and cultural behaviors all influence the transmission dynamics and impact of these diseases (El-Ottol et al., 2010; Hayajneh et al., 2010; Usman et al., 2003). While researchers frequently focus on the general population, voluntary blood donors represent a distinct group that typically exhibits lower infection rates due to pre-donation screening.

2.1 Overview of bloodborne diseases

2.1.1 Overview of Hepatitis B Virus (HBV)

Hepatitis B virus (HBV) belongs to the *Hepadnaviridae* family and contains partially double-stranded DNA. It causes liver disease and is one of the leading causes of viral hepatitis worldwide. HBV can result in both acute and chronic infections (Mohamud et al., 2024). The infection often remains asymptomatic, allowing individuals to transmit the virus unknowingly (Ishizaki et al., 2017). Approximately 50% of people living with HBV are unaware of their infection. The virus is highly contagious (Abebe et al., 2020), with a transmission efficiency about 100 times greater than that of HIV, and spreads through contact with infected blood or other body fluids, including through blood transfusion (CDC, 2024).

HBV accounts for more than 75% of hepatitis cases in parts of Asia, the Middle East, and Africa. Carrier rates vary across countries, even within the same continent. Endemicity is classified based on hepatitis B surface antigen (HBsAg) prevalence: low (<2%), intermediate (2–7%), and high ($\geq 8\%$). The estimated HBsAg carrier rate in Palestine is about 4%, placing it in the intermediate endemicity category (Adwan et al., 2005). In 2022, the World Health Organization estimated that 254 million people globally were living with chronic HBV infection, with approximately 1.2 million new cases each year. HBV is responsible for around 1.1 million deaths annually, primarily due to cirrhosis and hepatocellular carcinoma (WHO, 2024a). Adults aged 30–59 years are at higher risk of infection, partly due to lower vaccination coverage in this age group (CDC, 2023).

HBV is transmitted through contact with infected blood and body fluids. Common routes include needlestick injuries, sharing of contaminated needles, receipt of untested blood transfusions, and exposure in healthcare settings. Sexual transmission is more common among individuals with multiple partners or those who inject drugs. Vertical transmission can occur from mother to child during pregnancy, childbirth, or breastfeeding (WHO, 2024b). The virus is resilient, remaining infectious for up to seven days on environmental surfaces and in dried blood. It can also be transmitted through shared personal items contaminated with microscopic amounts of blood, such as nail clippers, razors, toothbrushes, body jewelry, and other sharp instruments (Hullett, 2024). In the present study, 11% of participants reported a family history of HBV infection, and limited public awareness about transmission routes may contribute to the persistence of HBV infections (Rasheed Hussein et al., 2016).

The clinical outcome of HBV infection is strongly influenced by the age at acquisition. Infections during infancy are usually asymptomatic and carry a >90% risk of progressing to chronic infection. Among children under five years, approximately 20% develop chronic infection. In contrast, more than 90% of individuals infected after the age of five, particularly adults, experience acute hepatitis and clear the virus within six months (WHO, 2015a).

In Palestine, the Ministry of Health reported 14 new cases of HBV in 2022, all among blood donors, corresponding to 0.28 cases per 100,000 population. Additionally, there were 359 chronic carriers, representing a prevalence of approximately 7.1 cases per 100,000 population (MOH, 2022).

HBV poses a significant challenge for blood safety because asymptomatic carriers can donate blood while remaining infectious. This risk is heightened in resource-limited settings where nucleic acid testing (NAT) is not available and screening relies solely on serological tests. The hepatitis B surface antigen (HBsAg) test, while widely used, cannot detect infections during the “window period,” which may last 38–49 days, depending on test sensitivity (Alzahrani et al., 2019; Žegarac & PhD, 2018). The WHO recommends combining serological and molecular testing to improve detection rates in high-prevalence regions. Such an approach reduces the likelihood of HBV transmission through blood transfusion (WHO, 2025a).

2.1.2 Overview of Hepatitis C Virus (HCV)

Hepatitis C is a liver inflammation caused by the hepatitis C virus, which belongs to the Flavivirus family, a group of single-stranded RNA viruses. Around the world, it is estimated

that 50 million individuals are living with chronic hepatitis C virus infection, and there are about 1 million new cases each year. The World Health Organization estimated that in 2022, around 242,000 individuals died from hepatitis C, primarily because of cirrhosis and hepatocellular carcinoma (primary liver cancer) (WHO, 2024c). In 2023, two new cases of hepatitis C virus (HCV) infection were reported **in Palestine**, specifically in the West Bank. This corresponds to an incidence rate of 0.04 per 100,000 people. There were also 86 HCV carriers found across the country, which corresponds to 1.66 carriers for every 100,000 people. There were 70 carriers in the West Bank, which is 2.38 per 100,000 people, and 16 carriers in the Gaza Strip, which is 0.72 per 100,000 people (MOH, 2023).

The virus can lead to both acute and chronic hepatitis, with severity ranging from mild illness to a severe and long-lasting condition that may include liver cirrhosis and cancer. Acute HCV infections are asymptomatic, and most do not progress to a severe illness (Lin et al., 2018).

The primary risk factor for the transmission of the hepatitis C virus (HCV) is the use of injectable drugs. Individuals who use drugs are at high risk of contracting bloodborne viral infections as a result of using shared, contaminated needles. Research carried out in Egypt found that 28% of individuals who tested positive for HCV had a history of drug use (Rasheed Hussein et al., 2016). Other transmission routes include blood transfusions, contaminated therapeutic equipment, sustaining occupational needlestick injuries with a 3% infectivity rate (K et al., 1994), and experiencing sexual or perinatal transmission.

About 55-85% of people who become acutely infected with the hepatitis C virus (HCV) will develop chronic infection. Over 20 to 30 years, 20 to 30 percent of people with chronic infection will progress to cirrhosis (Lingala & Ghany, 2015). Advanced fibrosis greatly increases the risk of hepatocellular carcinoma (HCC). Once cirrhosis is present, HCC develops at a rate of 1-4% per year around the world, with reports of rates as high as 8% in Japan. More and more people are getting chronic liver disease or needing a liver transplant. In 2021, HCV-related HCC killed about 150,000 people around the world, which is considered the highest number of deaths ever recorded (El-Serag, 2012). The chance of going from chronic HCV to cirrhosis (and then HCC) for a person's life is 15-35% (El-Serag, 2012). Direct-acting antivirals are now widely used and cure most patients and slow the progression of the disease. However, people who already have cirrhosis must be monitored regularly for HCC according to guidelines.

Blood banks typically test for anti-HCV antibodies as part of their standard screening process for HCV. These antibodies usually appear 6 to 10 weeks post-infection. However, during the early "window period", infected donors may still test negative, even though they are contagious when antibodies cannot be detected. Nucleic acid testing (NAT) can detect HCV RNA as soon as 1 to 2 weeks after infection; however, blood banks in Palestine do not currently use this method due to its complexity and expense. As a result, there is still a risk of HCV transmission via transfusion during this period (Shahin et al., 2025).

2.1.3 Overview of human immunodeficiency virus (HIV)

HIV infections may be caused by retroviruses, which are single-stranded RNA viruses that target immune cells, resulting in weak immunity, so the infected person becomes more susceptible to other diseases (Cachay, 2024). HIV is still a major health problem worldwide, and it has been responsible for around 42.3 million deaths so far. The transmission is still occurring in every country worldwide. By the end of 2023, an estimated 39.9 million

individuals were living with HIV, with 65% of them located in the WHO African Region. In the same year, about 630,000 individuals died from HIV, and around 1.3 million people were newly infected with HIV (WHO, 2024c).

According to WHO EMRO data, in 2023 shows that 0.1% of adults living with HIV in the Eastern Mediterranean Region, which is the lowest percentage in the world. However, key populations were still disproportionately affected. High rates of HIV infection occur with people who inject drugs (PWID) in Afghanistan (4.4%), Iran (9.3%), Egypt (2.4%), Morocco (7.9%), Tunisia (3.9%), and Pakistan (21%). Among men who have sex with men (MSM), HIV prevalence was highest in Lebanon (12.6%), followed by Morocco (5.7%), Sudan (1.4%), and Tunisia (1.4%). In addition, sex workers in some countries had higher rates of the disease, including Djibouti (12.9%), Somalia (5.2%), Egypt (2.8%), and Pakistan (3.8%) (WHO EMRO, 2020).

HIV is transmitted through the transfer of body fluids (such as semen, vaginal fluids, blood, and breast milk) from an infected individual, specifically via vaginal or anal intercourse, needle sharing, or from mother to child (HIV.gov, 2023). Currently, there is no cure for HIV, so effective prevention, early diagnosis, treatment, and care, including opportunistic infections, have enabled HIV infection to be managed as a chronic health condition. This allows infected people with HIV to live long and healthy lives (WHO, 2024d).

In Palestine, between 1988 and 2023, there were 146 cases of HIV/AIDS reported, 114 cases (78.1%) were diagnosed with AIDS, and 32 cases (21.9%) were HIV-positive. 122 cases were men, which is 83.6% of all cases. In most cases, about 84.3% of incidents occurred in people aged 20 to 49. This is the age group that's usually working and active, so it seems they are also more likely to get sick. The main way the virus spread was through heterosexual contact, causing 61.6% of the cases. Most cases are in people aged 30 to 39, making up about 33%. The next largest groups are ages 20 to 29, at around 30%, and ages 40 to 49, at about 22%. There were also cases in children (0-4 and 5-9 years), teenagers (10-19 years), adults over 50, and a few cases involving people of unknown age (MOH, 2023).

HIV is considered one of the most serious bloodborne diseases because it can be asymptomatic for a long time, so people who are infected can donate blood without knowing they are infected. Blood banks in Palestine regularly test all donated blood for HIV antibodies using serological assays according to WHO guidelines (WHO, 2024c). This silent carrier state makes it more likely that HIV will spread through blood donations, especially if the infection happens during the serological window period. Although the number of confirmed HIV cases in Palestine is still relatively low, the presence of asymptomatic carriers poses a silent threat to blood safety, and the risk increases when nucleic acid testing (NAT) is not available for early detection. HIV carriers who are unaware of their case can put blood recipients in danger, and it can also have serious consequences on the community and the affected people's families.

2.1.4 Syphilis

Syphilis is a sexually transmitted infection (STI) caused by the bacterium *Treponema pallidum*, leading to severe illness, and it can be fatal. Still, it can be effectively treated with antibiotics if detected early. The transmission of syphilis occurs through sexual contact with infected lesions, through blood transfusions, or from an infected mother to her

unborn child. According to the WHO, an estimated 8 million adults aged 15 to 49 contracted syphilis in the year 2022 (WHO, 2024e).

Blood banks test for syphilis because it is one of the transfusion-transmissible infections (TTIs) that could be serious, especially in fresh or poorly stored blood. After all, the bacterium *T. pallidum* can be alive in these conditions. For routine screening, serological tests, such as the Venereal Disease Research Laboratory (VDRL) or rapid plasma reagin (RPR) tests, are used (Ratnam, 2005). The World Health Organization (WHO) recommends these tests for all donated blood. However, these tests may not always detect syphilis during the early (primary) or latent stages of infection, particularly in individuals who do not have any symptoms. This means that blood donations could still spread the virus without anyone being aware of it (Papp, 2024).

There are currently very few cases of syphilis **in Palestine**, and no cases were reported among blood donors in 2020-2024 (MOH, 2022, 2023). Since routine syphilis screening is still an essential part of keeping blood safe. Because people can move around and infections cannot be detected in people who do not show any symptoms, syphilis screening prevents the infection from getting back into the blood supply and the community, especially when the advanced molecular testing systems are not available.

To treat syphilis, which is a bacterial infection, penicillin is used, which is considered the most common antibiotic (Schwartz, 2024). However, if syphilis remains untreated, it can cause serious problems, such as permanent damage to the heart, brain, and other organs, even after the infection has gone away.

WHO has put the elimination of syphilis as one of its goals in its global health strategies for sexually transmitted infections. The goal is to reduce the spread of the disease through a combination of public health strategies, including strict blood donor screening protocols (WHO, 2025b). Strengthening these efforts, especially in countries where the disease is less common, helps ensure the safety of blood transfusions and supports broader public health goals (WHO, 2016).

2.2 Global and Regional Prevalence of Transfusion-Transmissible Infections (TTIs)

The World Health Organization (WHO) reports significant disparities in blood safety and infection rates across countries with different income levels. In high-income countries, the prevalence of HBV, HCV, and HIV among blood donors is low, at 0.02%, 0.007%, and 0.002%, respectively. In contrast, in low-income countries, these rates are much higher—2.81% for HBV, 1.00% for HCV, and 0.70% for HIV (WHO, 2025a). These differences are mainly due to variations in donor selection criteria, public health policies, and the availability of advanced screening technologies (WHO, 2023). Globally, approximately 1.6 million blood donations are discarded each year due to reactive markers, with unsafe transfusion practices contributing to up to 15% of new HIV infections in sub-Saharan Africa (Nwankwo et al., 2012). A meta-analysis of over four million blood donations from 11 Asian countries reported pooled prevalence rates of 1.76% for HBV and 0.19% for HCV (Mohammed et al., 2023).

Between 2015 and 2019, a study of 230,225 donations in Shiyang found prevalence rates of 1.07% for HBV and syphilis combined, 0.40% for HBV, 0.19% for HCV, and 0.08% for HIV. The prevalence of these infections declined following the implementation of ID-NAT and enhanced pre-donation counseling (Zhao et al., 2025). Risk analysis indicated that men

aged 35–60 years and farmers were at higher risk for HBV and syphilis, whereas female students under 25 years of age were at greater risk for HIV.

2.3 Middle East and North Africa

The number of TTIs also varies across the Middle East and North Africa. There were 62,933 donors in Jordan from 2009 to 2013. Of these, 0.52% had HBsAg, 6.04% had anti-HBc, and 0.16% had anti-HCV (Souan et al., 2016).

There were 2,000 blood donors in Egypt, and 35 of them (1.75%) were anti-HCV positive. Most donors were men (99.6%) and resided in rural areas (75.75%). Anti-HCV positivity was linked to lower levels of education ($P \leq 0.05$), IV drug use, previous surgery, hospitalization, needle stick injury, family history, and previous HCV treatment ($P < 0.01$). Risk factors included having less education ($P \leq 0.05$), being married ($P \leq 0.05$), and having had surgery in the past ($P \leq 0.01$). Even though the number of people with HCV and HBV has decreased, the worry about transmission through medical procedures is still there (Darwish et al., 1992).

On the other hand, 97.65% of the 3,733 blood donors in northern Riyadh, Saudi Arabia (2019–2020) were men, and most of them were under 27. The rates of seroprevalence were 0.19% for HBsAg, 5.44% for HBsAb, and 0.32% for anti-HCV (Alqahtani et al., 2021). These differences are likely due to variations in the methods used to select blood donors and the differing capabilities of healthcare systems.

2.4 Evidence from Israel

Two comprehensive Israeli studies emphasize the significance of age, migration, and behavioral determinants. An analysis was conducted on 1.2 million blood donations (Vera et al., 2014) from over 600,000 volunteers between 2005 and 2009 to determine the frequency of new syphilis cases. Overall, about 47 out of every 100,000 people had syphilis, and new cases showed up at a rate of 8 per 100,000 person-years. Interestingly, the more someone aged, the more likely they were to have syphilis, each year adding about a 6% increase in odds. Donors aged 45 and up were about 7 times more likely to have syphilis than those under 25. Also, folks who immigrated from Africa to Israel after 1990 had a pretty high chance of having syphilis, with odds nearly 19 times higher than native-born Israelis. Those from Eastern Europe and South America also showed increased risks, but not quite as high. Plus, donors with syphilis were more likely to have other infections too: 8% had HIV, about 2% had hepatitis C, and a small number had hepatitis B, compared to those without syphilis.

A comparable case-control study (Kerzman et al., 2007) of 434 blood donors (178 who were HCV-positive and 256 who were HCV-negative) identified that the major risk factor for HCV infection is intravenous drug use (IVDU). After taking IVDU into account, other important factors are being elderly, having had a blood transfusion before 1990, first-time donation, and having bad dental hygiene. There were different patterns of risk according to data based on place of birth. For native Israelis (NIs), two major risk factors, such as close contact with people who are at risk for HCV (OR = 7.2, 95% CI: 1.9–27.8) and a history of surgery (OR = 7.3, 95% CI: 1.6–34.4), were strongly linked to infection. As for immigrants from the former Soviet Union (FSUIs), the major risk factors were gum surgery (OR = 7.6), hospitalization without surgery (OR = 2.6), and receiving injection-based therapy (OR = 4.9). These results suggest that IVDU is a central shared risk factor; however, different

screening methods may be required for different groups, depending on their exposure history. Each study examined one pathogen, but in association, they demonstrate the necessity of having other screening methods for different groups of people.

2.5 Evidence from Other Regions

In Brazil, a vast study looked at over 777,000 blood donations collected between 2008 and 2017. They found that about 3.5% of these donations tested positive for at least one blood-borne virus. Out of those, around 2.4% involved coinfections, with the most common being HBV-HIV (30.6%), HBV-HCV (30.4%), and HBV-HTLV (24.4%) (Virology Journal, 2021;18:206). The researchers also discovered that certain factors made coinfections more likely: being male (OR = 1.31), having less than 12 years of education (OR = 1.85), being single (OR = 1.71), donating blood for the first time (OR = 8.83), and living in Salvador (OR = 1.85). While coinfections are not as common as single infections, they tend to be more severe for specific groups, especially those with certain demographics and behaviors (Luz et al., 2025).

Meanwhile, a different study done in North Shoa, Ethiopia (Gebreyes et al., 2025), looked at 538 voluntary blood donors from April to July 2022. They wanted to see how common transfusion-transmissible infections (TTIs) are and what the risk factors might be. Turns out, about 7.4% had some TTI. The most common was syphilis at 3.0%, followed by HBV at 2.0%, HCV at 1.3%, and HIV at 1.1%. The study also found that men and young adults aged 18 to 25 had higher rates of these infections. Another risk factor was identified, including having body tattoos (AOR = 19.1, $p \leq 0.01$) and donating blood at Debre Berhan (AOR = 24.18, $p = 0.01$), which were significantly associated with HBV infection. The probability of getting syphilis (AOR = 3.78, $p = 0.03$ in men donors is considerably higher than in the others.

2.6 West and Central Africa

In Burkina Faso, the seroprevalence among 166,681 donors was high: 13.4% for HBV, 6.9% for HCV, 2.1% for HIV, and 2.4% for syphilis. Donors residing in rural areas are more likely to be infected. In rural areas, the rates of HBV were 14.0%, while in urban areas, they were 12.9% ($P < 0.001$). For HCV, the rates were 8.0% in rural areas and 5.9% in urban areas ($P < 0.001$). However, the variation in the number of HIV-positive individuals between rural and urban donors was not statistically significant; both groups had 2.1% ($P = 0.25$) (Wongjarupong et al., 2021).

A cross-sectional study conducted in Bamako, Mali (Jary et al., 2019), examined 8,207 donors regarding their donations in 2018. HIV prevalence was 2.16%, HBV 14.78%, HCV 2.32%, and syphilis 0.04%. Male gender, limited education, and age over 35 were identified as significant determinants of HBV (adj-OR ≈ 1.6 –2.4). HCV was much more prevalent outside the capital ($P < 0.001$). Rwanda showed decreased infection rates: HBV 1.3%, HCV 0.44%, HIV 0.065%, and syphilis 0.34%. However, first-time donors and males are still considered at higher risk (Nsekuye et al., 2024). Data from Kenya indicate a strong correlation between HIV and being married ($p = 0.0057$), having multiple sexual partners, and working in the informal sector. Additionally, there was a correlation between syphilis and previous transfusions. Male donors had a higher risk of HBV (OR = 2.92, $p = 0.0479$) (Bartonjo et al., 2019).

Abongwa et al. (Le, 2021) conducted a cross-sectional study in Bamenda, Cameroon, to determine the prevalence and risk factors associated with transfusion-transmissible infections (TTIs). A total of 4020 donors from 2015 to 2017 were investigated. Over the three years, the overall TTI rate moved downwards from 10.2% to 5.7% ($p = 0.001$). HIV (1.8%), syphilis (1.9%), and HCV (0.7%) were the most predominant infections. Male gender ($p = 0.001$), replacement donation making ($p = 0.005$), residing in a rural area ($p = 0.04$), and having only a primary-level education ($p = 0.005$) were all considered significant risk factors for TTI positivity. The percentage of coinfecting donors was 0.5%, most often HIV-syphilis and HBV-syphilis.

So, Puerto-Meredith and the team did a big review in 2023, looking at 27 different studies from Southern Africa between 2011 and 2021. Overall, they found that about 2 out of 100 blood donations had some transfusion-transmitted infection, or TTI. They also observed that certain groups were more likely to achieve positive outcomes. For example, people donating blood for the first time or those who were replacement donors were much more likely to test positive, especially for HIV and hepatitis B—like, six and three times more likely, respectively. Education seemed to play a role too—people with less schooling were more at risk for HIV because they might have dropped out early and started working young. Age also mattered; folks over 25 were at a higher risk of syphilis. Interestingly, women and repeat donors appeared to be better protected against these infections. All of this points to the importance of focusing on first-time donors and replacement donors when it comes to making sure blood remains safe, as Puerto-Meredith et al. suggested (Puerto-Meredith et al., 2023).

2.7 Conclusion

Bloodborne diseases remain a significant public health concern and continue to threaten blood safety. Their prevalence varies greatly, ranging from less than 0.01% in high-income countries to over 14% for hepatitis B virus (HBV) in some parts of West Africa. Sociodemographic, behavioral, and systemic factors are important determinants, particularly among first-time, replacement, and rural donors.

In countries like Palestine, there is a notable gap in peer-reviewed research and a lack of strong, locally adapted screening protocols. These gaps include insufficient surveillance data, limited access to advanced testing methods, and inadequate donor risk assessment. Such weaknesses in the blood safety system increase the risk of transfusion-transmissible infections (TTIs).

TTIs have effects that extend beyond the health sector, impacting families and communities. Detecting carriers is often challenging, and without proper follow-up, infected individuals may remain untreated and continue to pose a transmission risk.

This thesis addresses these gaps by providing a detailed estimate of TTI prevalence among blood donors in the West Bank from 2020 to 2024 and by identifying associated local risk factors. The findings highlight the need for targeted strategies tailored to specific risk profiles. Strengthening the screening system is essential to reduce transmission risks, ensure the safety of transfusions, and protect public health.

Chapter Three

Methodology

3.1 Study design

The study design is a retrospective cohort study for all patient files of the Palestinian Ministry of Health Preventive Medicine Department for all cases of bloodborne diseases (HIV, HBV, HCV, and Syphilis) recorded between 2020-2024.

3.2 Setting

The data were collected from all patient health files related to bloodborne diseases from Westbank's MOH preventive medicine department between 2020-2024.

The West Bank consists of 11 governorates: Hebron, Ramallah and Al-Bireh, Bethlehem, Nablus, Jericho, Jenin, Tubas, Jerusalem, Tulkarm, Salfit, and Qalqilya. Every governorate has its health directorate, which receives reports from these health directorates each month. Each governorate has a dedicated health directorate that reports all cases of bloodborne diseases to the Preventive Medicine Department at the Ministry of Health.

3.3 Sample and sample size

The study includes all positive blood donor cases discovered to be infected through laboratory testing after donation between 2020 -2024.

3.4 Inclusion and exclusion criteria

Inclusion criteria:

All positive cases of blood donors that were discovered to be infected through laboratory testing after donation and reporting by preventive medicine will be included in the study between 2020 to 2024 retrospectively, such as HBV, HCV, HIV, and syphilis.

Only blood donors aged 18 to 60 years, as per blood bank regulations, will be eligible for inclusion.

Exclusion criteria:

All blood donor cases were found to be free of bloodborne diseases after laboratory examination.

Individuals outside the age range of 18 to 60 years will also be excluded, by blood bank regulations.

3.5 Data collection

The data collection for this study utilized the routine documentation practices implemented by the Palestinian Ministry of Health (MOH). Data extracted from standardized investigation forms used by the preventive medicine departments and manually entered into the District Health Information Software 2 (DHIS2) surveillance system.

The West Bank is divided into 11 governorates, each governed by a health directorate responsible for overseeing public health activities, including blood bank operations. Blood banks submit monthly reports to their respective health directorates detailing the total number of blood donors and the identification of individuals diagnosed with blood-borne diseases. Each of the bloodborne diseases under investigation, HBV, HCV, HIV, and syphilis, has a disease-specific form designed to capture critical data relevant to its documentation requirements. These forms collect information on demographic characteristics, behavioral and medical risk factors, and follow-up actions. Healthcare professionals, including physicians and nurses, complete preventive medicine forms after confirmatory testing.

Identification of patients in the recording is done by serial number; no names or contact information are collected. The data come from files kept in the health system at the PMD of MOH. These files include basic demographic details and other important information we needed for our study (you can find the file attached in the chapter of the appendix).

3.6 Validity

After constructing the data collection form related to research variables, it was reviewed by three experts: an infectious disease specialist and two academic learning doctors. Their comments were taken into consideration and modified before data collection, and the experts approved the data collection form.

3.7 Reliability

Data were collected from patient files of the PMD of the MOH through a data collection form that experts evaluated. A pilot study was conducted to evaluate and test the questionnaire's reliability and validity. It involved 5 participants chosen from different locations outside the study sample, yielding a Cronbach's Alpha of 0.82.

3.8 Duration of the study

The study received ethical approval on February 4, 2025, with the approved protocol covering the period from February 2 to February 16, 2025. As outlined in the research proposal, data collection was conducted from March to May 2025, followed by data analysis in June 2025.

3.9 Instrumentation

The Palestinian Ministry of Health issued an investigation form related to the Communicable Disease Notification Form. This form was used to gather information on people who had hepatitis B, hepatitis C, or HIV/AIDS. This form requests a variety of information, including demographic details, diagnosis, intervention, vaccination status, and coordination activities. We developed a new data collection tool based on the analysis of this form, which covers all the study variables important to the research questions and goals. The appendix chapter of this thesis has a new form that was made.

- Sociodemographic data
- Epidemiological data
- Source of infection
- Clinical data (symptoms, signs)
- Laboratory results
- Patient vaccination for hepatitis B

3.10 Variables (Study Measures)

- Dependent Variable:
 - Infection status
- Independent Variables (Predictors/Risk Factors):
 - Gender (Male/Female)
 - Age
 - Governorate/Region
 - Place of residence (urban/rural/camp)
 - Occupation (Worker, Student, Housewife, etc.)
 - Vaccination status (Yes / No)
 - Year of donation (2020–2024)

3.11 Data analysis

The statistical analysis is planned using SPSS Version 23 for data entry, cleaning, and statistical analysis, providing a comprehensive platform for both descriptive and inferential statistics. The numerical data on the prevalence of blood-borne diseases and associated risk factors among blood donors were summarized using descriptive statistics. This included using frequencies and percentages to describe the distribution of individuals affected by bloodborne diseases and the associated risk factors. Additionally, measures of central tendency (mean and median) and dispersion (standard deviation) were used to provide a detailed summary of the data. Inferential statistics, like the chi-square test, will be conducted to examine the relationships between categorical variables, such as demographic factors, and the prevalence of bloodborne diseases. We will use tests like the chi-square to see if there is a real connection between the two variables. Statistical significance for all tests will be set at $p < 0.05$. We also used cross-tabulations with outcome variables to show how many donors did not know they were infected before they gave blood, especially those who were positive for HBV and HCV. The prevalence of all bloodborne diseases was determined by summing the total number of cases for each bloodborne disease (HBV, HCV, HIV, and syphilis) and dividing the total by the number of blood donors screened during the study period *100%.

3.12 Ethical consideration

The study was reviewed and authorized by the Faculty of Public Health Research Committee and the Graduate Studies Committee at Al-Quds University to ensure that the study complies with ethical and IRB guidelines. Formal approval will also be requested from the Palestinian MOH through a letter from Al-Quds University. All data is kept private, securely stored on a password-protected system, and anonymized to protect patients' identities.

Chapter Four

Result

4.1 Study sample

This study is based on data reported by the Palestinian Ministry of Health (MoH), specifically from the national blood bank system, covering the period from 2020 to 2024. The data includes records of everyone who donated blood during this period, with a focus on those who tested positive for one or more of the primary bloodborne diseases: Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), and Hepatitis C Virus (HCV).

The dataset consists of two main parts. The first part of the data shows the total number of blood donors each year, along with the number of those tests that came back positive or negative. The second part, which is more detailed, examines case-level data for individuals who tested positive. During the study period, 808 blood donors tested positive for at least one of the three infections. This subgroup is the primary group that will be used for the research's analytical phase.

During the study period, there were 808 cases, with 654 HBV-positive cases, which accounted for 81% of confirmed positive cases, making it the most common bloodborne disease. HCV was identified in 137 people, approximately 17%. The number fluctuated slightly each year but remained lower than the number for HBV. HIV was the rarest, with only 17 confirmed cases, representing 2%, according to Table 1.

Table 1: Total Number of Seropositive Blood Donors by Infection Type (2020-2024)

Infection	Number of positive cases	Percentage
HBV	654	81%
HCV	137	17%
HIV	17	2%
Total	808	

The number of seropositive blood donors varied across different types of infections and years from 2020 to 2024. The highest number of cases in 2023 was related to HBV (180 cases), and the lowest was 83 cases in 2021. The highest number of HCV cases was reported in

2023, with 37 cases, and the lowest was in 2024, with 16 cases. The number of HIV cases showed a gradual increase over the years, the highest number being in 2023, with 7 cases, and no cases reported in 2020. In total, the most common infection is HBV, with 81%, followed by 17% of HCV and 2% of HIV cases. Table 2 shows the percentage of each infection type that occurred in each year. For instance, 41.2% of all HIV cases happened in 2024. The chi-square test gave a value of 21.211, and the p-value was 0.007. Since this is less than 0.05, it suggests there is a statistically significant link between the year and the type of infection. This shows that the way infections spread has changed a lot over time. These results highlight the importance of monitoring disease spread and developing tailored health plans for each case, ultimately ensuring blood safety. Figure 1 shows that the number of seropositive blood donors varied across different types of infections and years from 2020 to 2024.

Table 2: Crosstabulation of Infection Type by Year Among Seropositive Blood Donors (2020–2024)

year		Infection type				Total	Pearson Chi-Square	P- value
		HBV	HCV	HIV				
2020	count	111	20	0	131	21.211 ^a	.007	
	% within Infection type	17.0%	14.6%	0.0%	16.2%			
2021	count	83	28	4	115			
	% within Infection type	12.7%	20.4%	23.5%	14.2%			
2022	count	134	36	2	172			
	% within Infection type	20.5%	26.3%	11.8%	21.3%			
2023	count	180	37	4	221			
	% within Infection type	27.5%	27.0%	23.5%	27.4%			
2024	count	146	16	7	169			
	% within Infection type	22.3%	11.7%	41.2%	20.9%			
Total	count	654	137	17	808			
	% within Infection type	100.0%	100.0%	100.0%	100.0%			

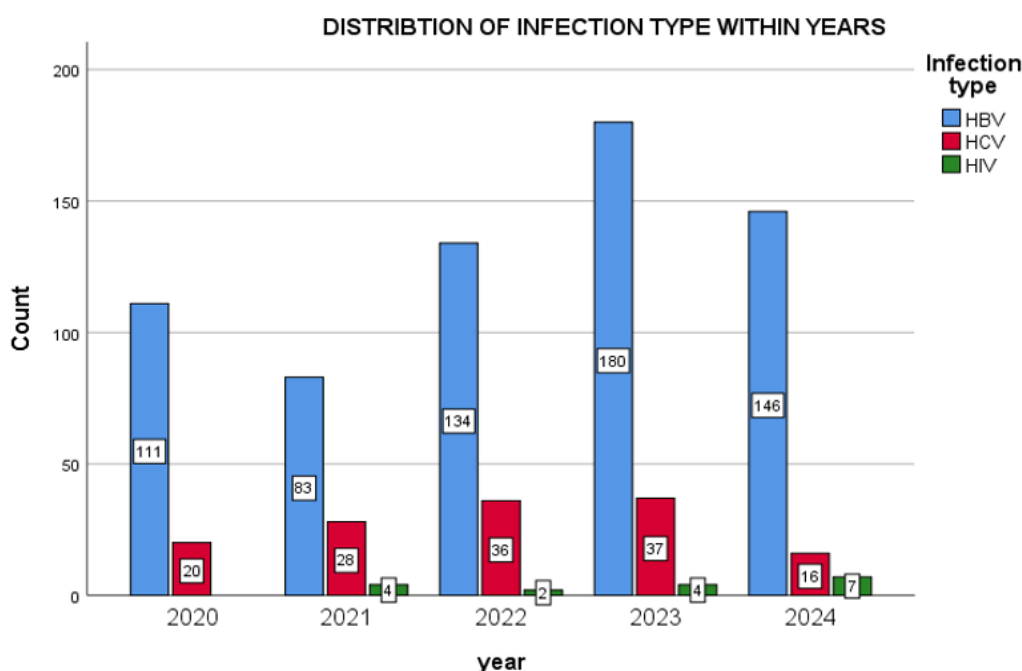


Figure 1: Distribution of Seropositive Blood Donors by Infection Type and Year (2020–2024)

Regarding vital status, 805 donors (99.6%) were reported as alive, while only 3 (0.4%) were reported as deceased. This high survival rate is understandable, given how the diseases behave in their early stages, especially among individuals who are generally healthy enough to donate blood without any symptoms appearing in them. This may be due to the long incubation period of bloodborne disease.

Table 3 and Figure 2 present the distribution of reported positive cases across different governorates in the West Bank. Hebron recorded the highest number of cases, 198 (24.5%), followed by 154 cases in Jenin (19.1%), 123 cases in Tulkarem (15.2%), and 120 cases in Bethlehem (14.9%). These four governorates made up approximately 73% of the 808 positive cases. On the other hand, Qalqilya had the fewest cases, with 3 (0.4%), Tubas had 14 (1.7%), and Jericho had 16 (2.0%). There is variation in distribution among governorates; this may be attributed to the variation in risk factors, access to healthcare, public health surveillance, or variations in people's behavior across different areas.

Table (3-A): Number and Percentage of Confirmed Bloodborne Infection Cases Reported by Governorate in the West Bank (2020–2024)

Governorate	No. of cases	Percentage
Bethlehem	120	14.9
Hebron	198	24.5
Jenin	154	19.1
Jericho	16	2.0

Table (3-B) Number and Percentage of Confirmed Bloodborne Infection Cases Reported by Governorate in the West Bank (2020–2024)

Nablus	49	6.1
Qalqilya	3	0.4
Ramallah	71	8.8
Salfit	25	3.1
Tubas	14	1.7
Tulkarem	123	15.2
Yatta	35	4.3
Total	808	100.0

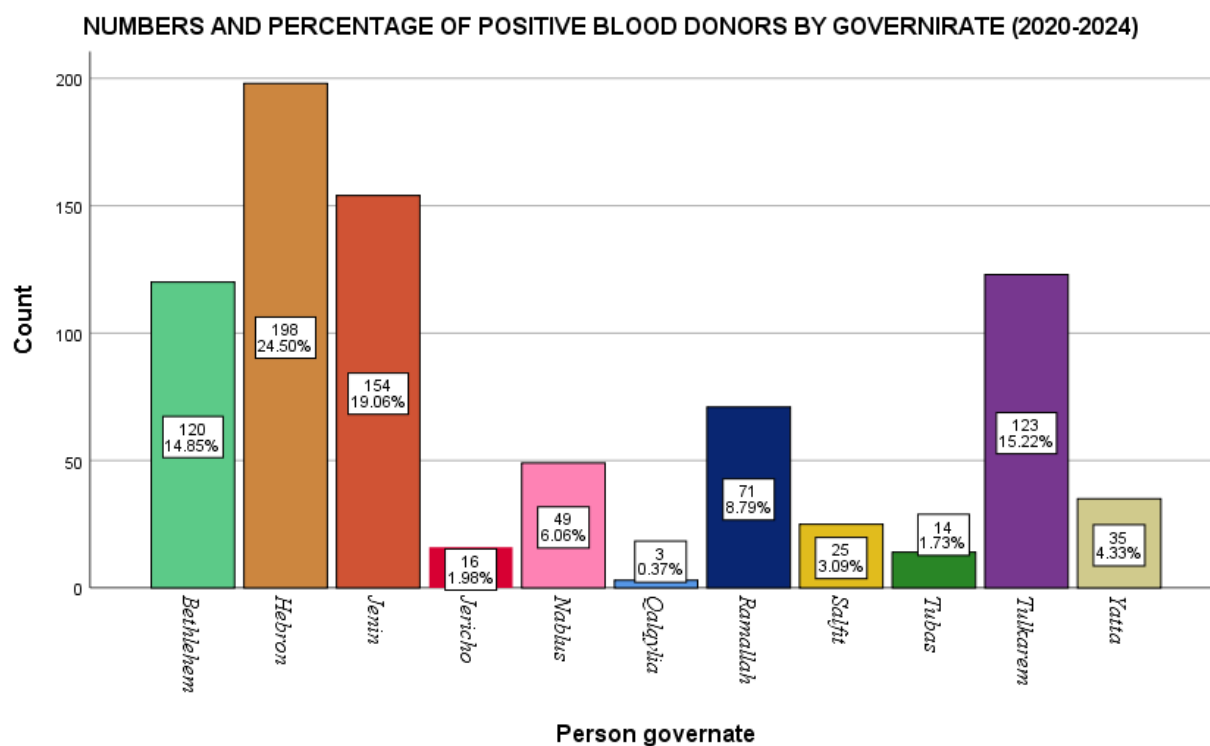


Figure 2: Geographic Distribution of Confirmed Bloodborne Infection Carriers by Governorate (2020–2024)

The distribution of positive donor incidents by residency reveals that the majority occurred in urban areas, with 61% of the reported incidents indicating that a significant number of BBD also occurred in more densely populated regions. Rural areas followed with 36% of incidents. In contrast, camp settings had the fewest incidents, accounting for 4%. This data highlights that urban environments are the most common locations for BBD incidents, with rural areas also contributing substantially, while camps are less frequently associated with such incidents. Figure 3 below illustrates the distribution of the sample by type of locality.

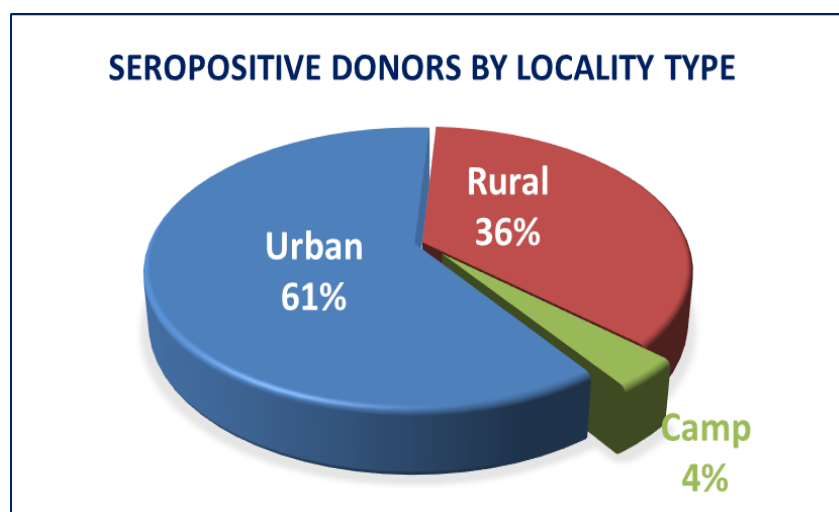


Figure 3: Percentage of carriers Bloodborne Infection Reported by Locality Type

The sample of gender distribution shows that the majority of positive bloodborne diseases are males, with 69% of the positive cases, and only 31% are females, as shown in Figure 4.

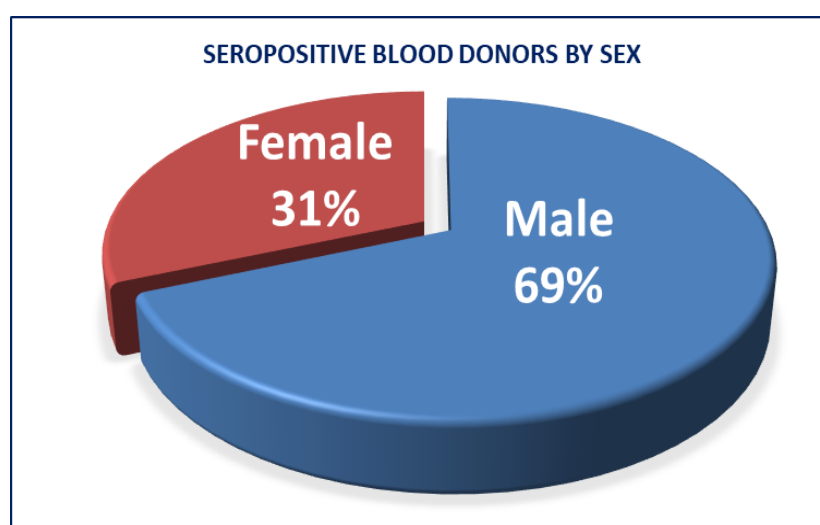


Figure4: Percentage of carriers of Bloodborne Infection s Reported by sex

The mean age of the population is 42.01 years, with a standard deviation of 9.86, indicating a wide range in ages. Additionally, the age distribution of the positive cases revealed that the most common age at diagnosis was 38 years, indicating that this was the most prevalent age at which people in the dataset were diagnosed, with a minimum age of 18 and a maximum age of 60 years. This means that most positive cases occur in middle adulthood, which aligns with the age group breakdown we observed earlier. Table 4 below presents our findings.

Table 4: Age Descriptive Statistics of Confirmed Bloodborne Infection Carriers (2020–2024)

Age					
Number of cases	Minimum	Maximum	Mean	Std. Deviation	Mode
808	18	60	42.01	9.860	38

The age distribution of positive cases is also roughly bell-shaped (standard), but it is a little skewed to the right. This means that there are more cases in people aged 30 to 40 than in people of other ages. The results are shown in Figure 5 below.

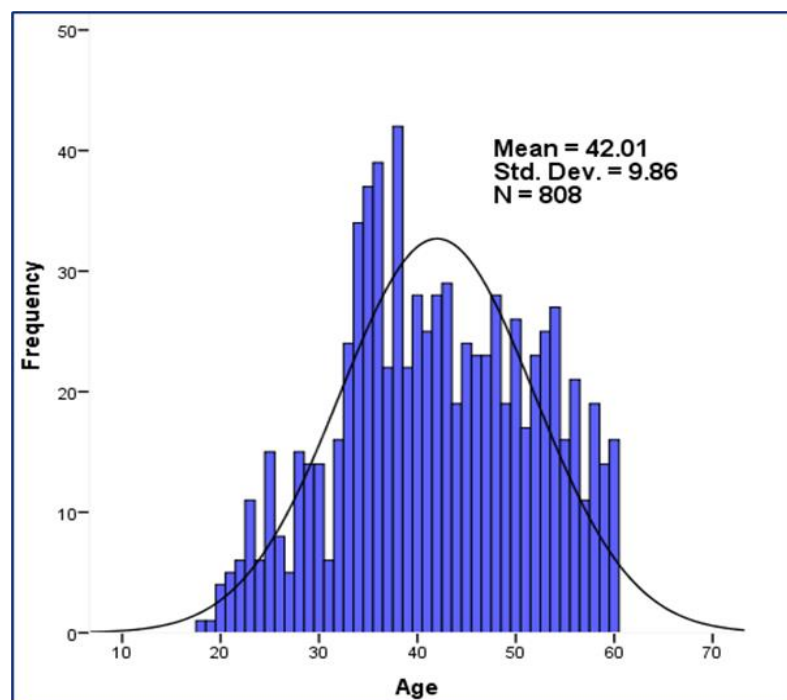


Figure 5: Frequency Distribution of Age in the Study Population

The age distribution revealed that most positive cases were among adults in their working years. The most affected age group among the 808 positive cases was 34 to 41 years old, accounting for 30.9% of all confirmed cases. This was followed by the group were people between the ages of 42 to 49, who made up 23.8% of the cases. People between the ages of 50 to 57 made up another large group, accounting for 20.5% of all cases. The 18 to 25 and 58+ age groups, on the other hand, had the lowest percentages, each making up only 6.1%. 12.6 percent of the cases were people between the ages of 26 and 33. These results suggest that middle-aged adults are the most likely to get bloodborne infections. This could be because they are more likely to be around risk factors or to donate blood. Table 5 and Figure 6 show the distribution of cases across different age groups. These groups require targeted awareness, screening, and prevention efforts.

Table 5: Number and Percentage of Confirmed Bloodborne Infection Cases by Age Group

Age Group	No. of cases	Percentage
18 - 25	49	6.1%
26 - 33	102	12.6%
34 - 41	250	30.9%
42 - 49	192	23.8%
50 - 57	166	20.5%
58+	49	6.1%
Total	808	100.0%

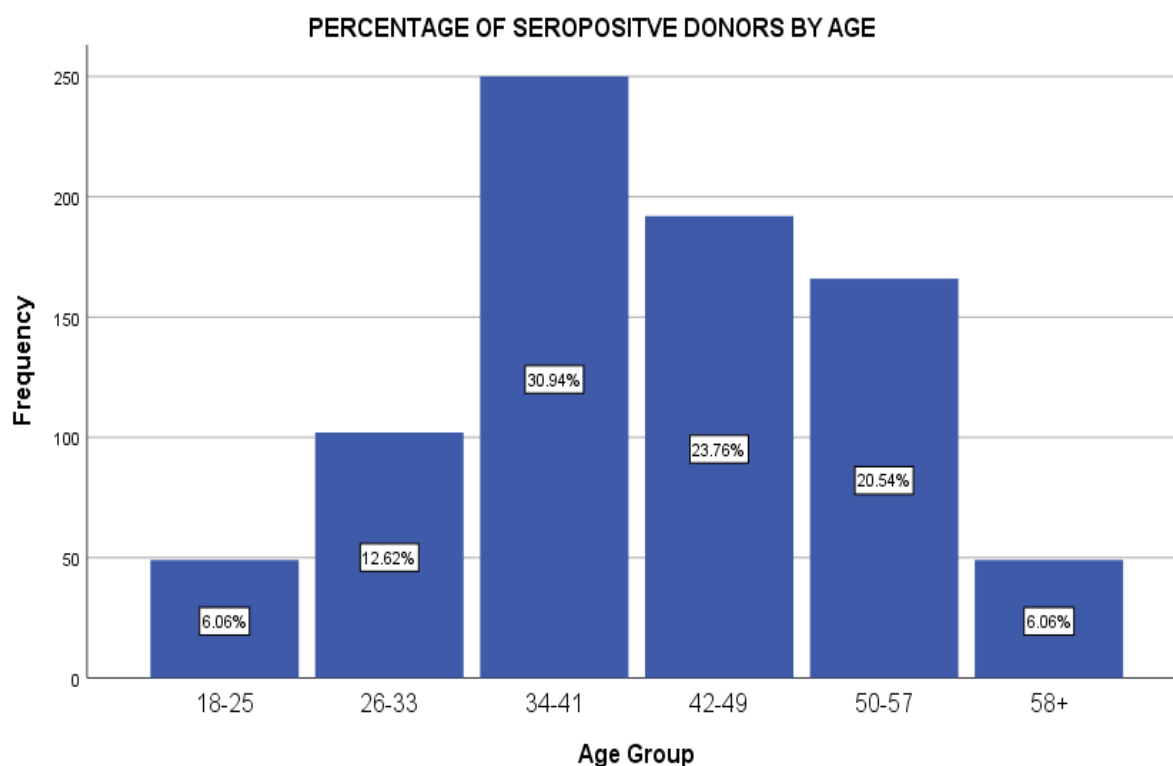


Figure 6: Percentage of Confirmed Bloodborne Infection Carriers Reported by Age Group in the West Bank (2020–2024)

The most common occupational group among the sample was workers, approximately 37%. This means that many people who are infected are working, possibly in manual or informal jobs. 14.16% of the sample were housewives, which is in line with the gendered distribution of unpaid domestic work. Students (2.53%), unemployed people (3.92%), farmers (0.25%), and self-employed individuals (4.33%) were smaller groups. Another 0.36% were put in the "other" category. This distribution indicates that infections are prevalent across a wide range of occupations, with a notable focus on individuals who are economically active and of working age. This could affect both the risk of exposure and the ability to access healthcare. Figure 7 below illustrates the distribution of positive donors by job status.

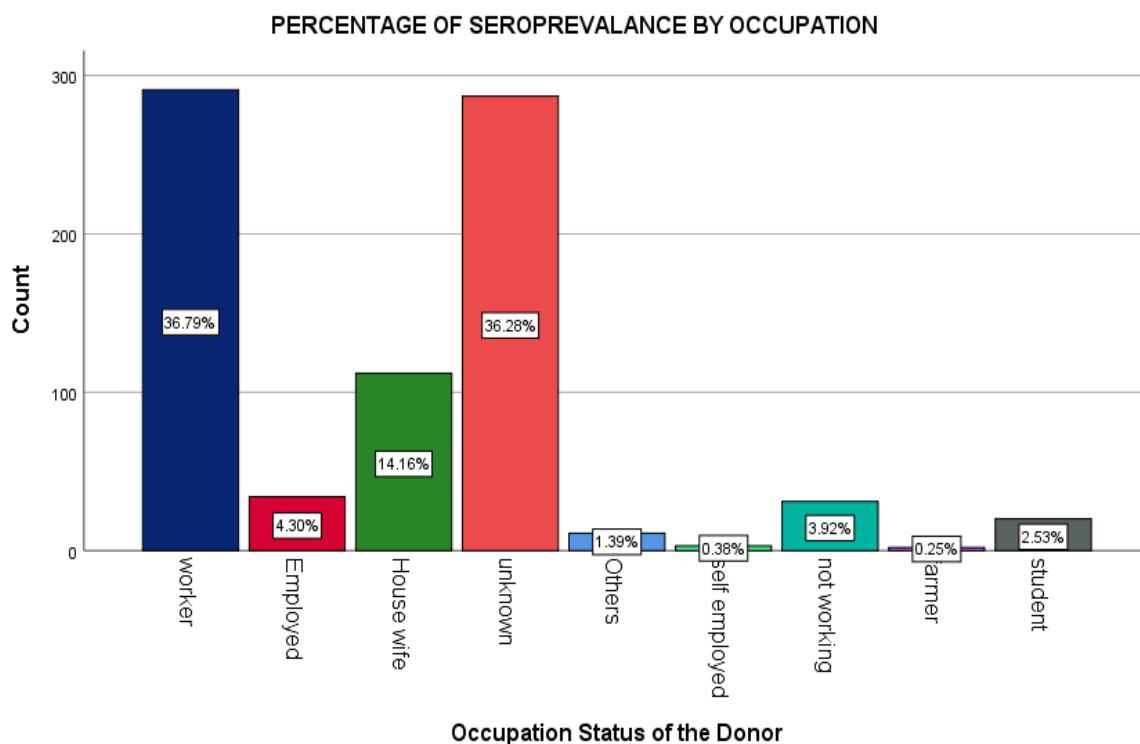


Figure 7: Distribution of Confirmed Bloodborne Infection Cases by Work Status

Table 6 shows that the highest number of bloodborne diseases is reported among donors classified as workers, with 236 cases of HCV and 55 cases, totaling 291 cases. This group includes individuals working in roles associated with these two types of infections. There is no data about the occupational status of HIV donors. The second highest number is among donors with unknown work type, with 244 HBV cases and 43 HCV cases, which is also significant. Among housewives, the total is 112, with 99 infected with HBV and 13 with HCV. The total number of employed workers is 34 cases, others 11 cases, self-employed 3 cases, those not having a job 31 cases, farmers 2 cases, and finally students 20 cases.

Table 6: Distribution of HBV and HCV Infections by Donor Occupation Status

Occupation Status of the Donor		Infection type		Total
		HBV	HCV	
Occupation Status of the Donor	worker	236	55	291
	Employed	27	7	34
	House wife	99	13	112
	unknown	244	43	287
	Others	10	1	11
	self employed	1	2	3
	not working	19	12	31
	farmer	1	1	2
	student	17	3	20
Total		654	137	791

4.2 Prevalence of Bloodborne Diseases (HBV, HCV, HIV)

This section addresses Research Question 1: *What is the prevalence of bloodborne diseases (HBV, HCV, HIV) among blood donors in the West Bank from 2020 to 2024?* To answer this question, the researcher examined annual totals of blood donors alongside the number of confirmed positive cases for each infection during the study period.

4.2.1 Prevalence of HBV among blood donors in the West Bank

In the West Bank, the total number of blood donors tested for Hepatitis B, C, HIV, and syphilis is 259,998, during the period of the study, 654 donors were positive for HBsAg, indicating that the total prevalence of HBV between 2020 and 2024 is 0.25% of the donors tested had the virus. Figure 8 shows that the yearly HBV rates went up and down over the five years. The rate was 0.24% in 2020 and decreased to 0.20% by 2021. The rate returned to increase in 2022, rising slightly to 0.22%, then substantially to 0.29% in 2023, and peaking at 0.31% in 2024. These changes indicate a slow upward trend, emphasizing the importance of monitoring developments, getting vaccinated, and educating the public about health to prevent blood donors from spreading HBV.

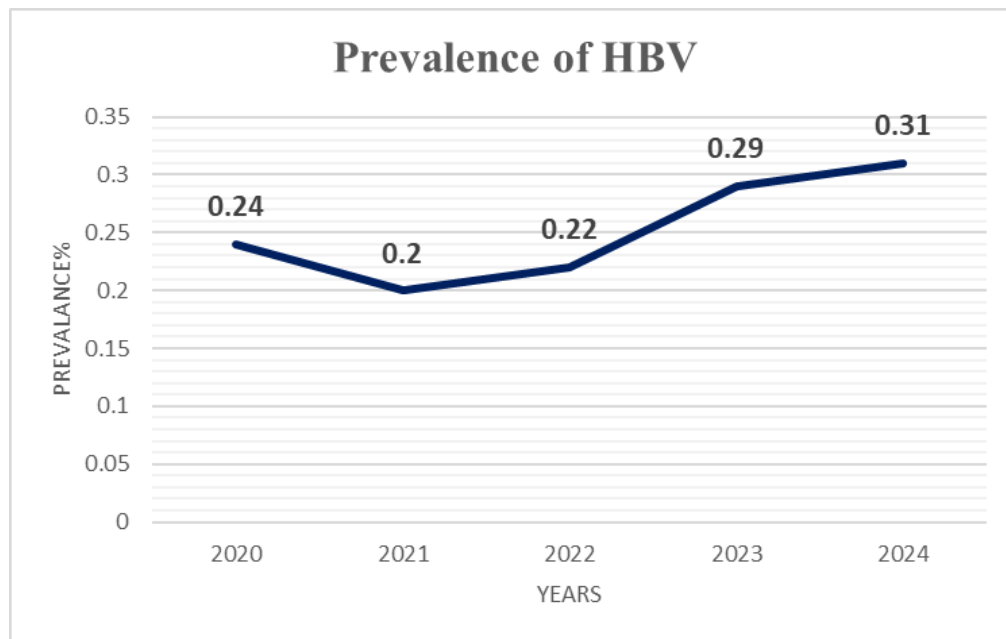


Figure 8: Prevalence of HBV (2020-2024)

Table 7 presents the prevalence of HBV among blood donors in the West Bank from 2020 to 2024, showing notable variation between governorates. The highest prevalence was recorded in Jenin at 0.51% (124 cases out of 24,547 donors), followed closely by Hebron at 0.49% (212/42,897), Tulkarm at 0.45% (97/21,569), and Bethlehem at 0.44% (87/19,795). Salfit (0.38%) and Tubas (0.27%) were also above the West Bank average of 0.25%. These findings suggest that certain governorates may have local factors contributing to higher HBV transmission risk.

In contrast, Jericho reported a prevalence of 0.18% (13/7,073), while Ramallah (0.11%), Nablus (0.05%), and Qalqilya (0.02%) had rates well below the average, despite Ramallah and Nablus having large donor populations. The variation in HBV prevalence across

governorates may reflect differences in community-level risk factors, vaccination coverage, healthcare access, and public awareness regarding HBV prevention.

Table (7): Prevalence of HBV (2020–2024) by Governorate

Governorate		Total blood donors	Positive HBV	HBV Prevalence (2020-2024)
Above the Average	Jenin	24547	124	0.51%
	Hebron	42897	212	0.49%
	Tulkarem	21569	97	0.45%
	Bethlehem	19795	87	0.44%
	Salfit	3468	13	0.38%
	Tubas	4071	11	0.27%
West Bank Average		259,998	654	0.25%
Below the Average	Jericho	7073	13	0.18%
	Ramallah	51437	55	0.11%
	Nablus	75673	40	0.05%
	Qalqilya	9338	2	0.02%

4.2.2: Prevalence of HCV among blood donors in the West Bank

The number of hepatitis C-positive cases during the study period, from 2020 to 2024, is 137, which translates to a prevalence of 0.053% over the past five years. In general, the prevalence is low, but there are still positive HCV cases among donors, indicating that it is essential to maintain regular screening tests and prevention measures in blood banks to prevent an increase in this rate.

Figure 9 shows the prevalence of HCV by year. In 2020, the rate was 0.04%, and it reached its highest rate in 2021, at 0.007%. The rate then started to decline in 2022 and 2023, with a prevalence rate of 0.006%, and further decreased to 0.0034% in 2024, which is the lowest prevalence among the study years. These variations suggest that the bloodborne disease is still present, but good public health measures and effective monitoring are helping to keep BBD under control and prevent its spread.

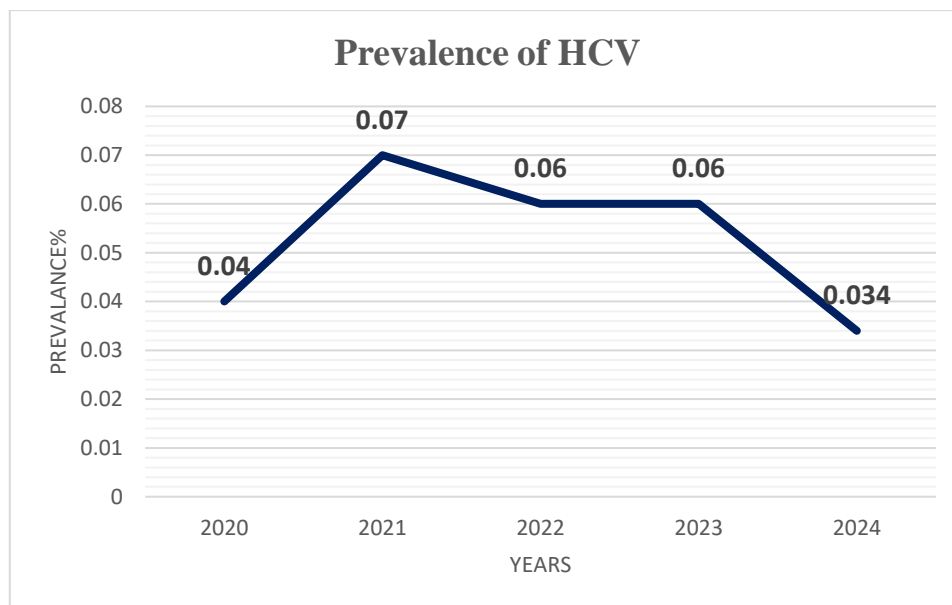


Figure 9: Prevalence of HCV (2020-2024)

Table 8 illustrates the variation in HCV prevalence among blood donors across West Bank governorates between 2020 and 2024. The highest prevalence was observed in Salfit at 0.38% (13 cases out of 3,468 donors), despite its relatively small donor population. Bethlehem followed with a prevalence of 0.16% (31/19,797), while Tulkarm recorded 0.12% (25/21,569). Jenin and Tubas reported moderate prevalence rates of 0.11% (28/24,547) and 0.07% (3/4,069), respectively.

In contrast, several governorates had prevalence rates below the West Bank average of 0.052%. Jericho and Ramallah each recorded a prevalence of 0.03%, with 2 and 14 positive cases, respectively. Hebron also reported 0.04% (15/42,435). Nablus had a notably low prevalence of 0.01% (7/75,783), while Qalqilya reported no positive cases during the study period.

The marked differences in prevalence across governorates suggest the influence of local epidemiological factors, healthcare accessibility, and awareness levels. These findings highlight the need for governorate-specific prevention strategies and continuous monitoring to assess the effectiveness of interventions.

Table (8-A): Prevalence of HCV (2020-2024) By Governorate

	Governorate	Total blood donors	Positive HCV	HCV Prevalence (2020-2024)
Above the Average	Salfit	3,468	13	0.38%
	Bethlehem	19,797	31	0.16%
	Tulkarm	21,569	25	0.12%
	Tubas	4,069	3	0.07%
	Jenin	24,547	28	0.11%
West Bank Average		259,9988	137	0.052%
Below the Average	Jericho	7,073	2	0.03%
	Nablus	75,783	7	0.01%

Table (8-B) : Prevalence of HCV (2020-2024) By Governorate

Qalqilya	9,338	0	0.00%
Ramallah	51,314	14	0.03%
Hebron	42435	15	0.04%

4.2.3: Prevalence of HIV among blood donors in the West Bank

The number of HIV positive cases during the five-year study period is 17 donors, which means the overall prevalence rate of HIV is 0.007%. HIV remains uncommon among donors. In 2020, there were no reported positive HIV cases, even though nearly 46,000 donors were tested. In 2021, there were 4 reported positive cases with a prevalence rate of 0.01%. In 2022, there were 2 cases, and the prevalence rate was 0.003 %. In 2023, there were 4 cases with a 0.006 % prevalence rate. The number of cases was highest in 2024, with a prevalence rate of 0.015 %. Figure 10 illustrates the prevalence rate of HIV during the years of the study with annual reported case counts.

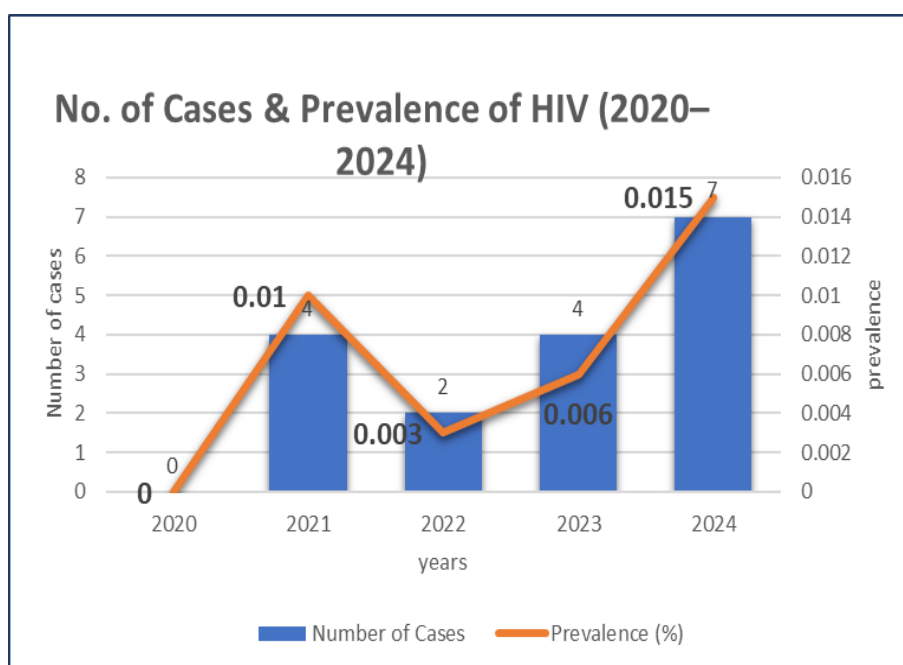


Figure 10: Prevalence of HIV (2020-2024)

Table 9 shows that the prevalence of HIV at the governorate level varies; some governorates have no cases, and some of them also have a few cases with a low prevalence rate. In Hebron, about 0.0128 of donors are affected, with 5 cases out of 39,054 donors tested. This prevalence rate may be attributed to its large population and the presence of more blood banks than other governorates, which could lead to a higher donation rate compared to other governorates. Yatta is the second one that has a prevalence rate of 0.025% with one case out of 3877.

For other governorates, a few cases were also reported. Bethlehem had 2 cases (0.0101%), Ramallah had 2 cases (0.0039%), Tulkarm had 1 case (0.0046%), Nablus had 2 cases (0.0026%), Qalqilya had 1 case (0.0107%), and Jenin had 2 cases (0.0082%). There were no cases in Salfit or Tubas during the study period. HIV is not common among donors, but it is hazardous due to the underreporting of HIV in Palestine, as the majority of cases are reported as AIDS.

Table (9) : Prevalence of HIV (2020-2024) By Governorate

	Governorate	Total blood donors	Positive HIV	HIV Prevalence (2020-2024)
Above the Average	Yatta	3,877	1	0.025%
	Hebron	42931	6	0.0128%
	Qalqilya	9,338	1	0.0107%
	Bethlehem	19,794	2	0.0101%
	Jenin	24,345	2	0.0082%
West Bank Average		259988	17	0.006%
Below the Average	Tulkarem	21,569	1	0.0045%
	Ramallah	50,738	2	0.0039%
	Nablus	75,592	2	0.0026%
	Salfit	3,468	0	0.00%
	Tubas	4,069	0	0.00%
	Tulkarem	21,569	1	0.0045%
	Ramallah	50,738	2	0.0039%

4.3 Demographic characteristics associated with HIV, HBV, and HCV

The purpose of this section is to answer research question number 2: "What demographic factors, like age, gender, job, and place of residence, are linked to the high rates of HIV, HBV, and HCV among blood donors in the West Bank?"

To answer this question, the researcher examined the demographic information of the 808 case-level data for individuals who tested positive.

4.3.1. Blood Donors' Sex and Infection Status

Most of the infected persons were males, with 556 cases, accounting for 68.8% of the total. In contrast, females accounted for 31.2%, with 252 cases. The most common infection is HBV, with approximately 81% of cases, of which 66.2% were males and 33.8% were females. Regarding HCV, the total number of cases is 137, or 17% of the total cases. Most of these were males, with 78.8%, and 21.2% were females. HIV has the lowest number of cases, with 17, which represents 2.1% of all cases. Most men with HIV make up about 88.2%, while women are around 11.2%. A chi-square test showed there is a statistically significant link between the donor's gender and the kind of infection they had. The numbers were significant enough to suggest it is not just a coincidence ($\chi^2 = 11.464$, $p = .003$). This means that the types of infections were not equally distributed between men and women. Table 10 shows a summary of these results.

Table 10: Association Between Donor Sex and Infection Type (HBV, HCV, HIV) Among Blood Donors (2020–2024), with Chi-Square Test Results

donor sex			Infection type			Total	Pearson Chi-Square	P- value
			HBV	HCV	HIV			
sex	Male	Count	433	108	15	556	11.464 ^a	.003
		% within donor sex	77.9%	19.4%	2.7%	100.0%		
		% within infection type	66.2%	78.8%	88.2%	68.8%		
	Female	Count	221	29	2	252		
		% within donor sex	87.7%	11.5%	0.8%	100.0%		
		% within Infection type	33.8%	21.2%	11.8%	31.2%		
Total	Count	654	137	17	808			
	% within donor sex	80.9%	17.0%	2.1%	100.0%			
	% within Infection type	100.0%	100.0%	100.0%	100.0%			

A total of 654 individuals tested positive for HBV during the study period, 2020–2024. Out of the total 654 positive cases, 433 were male, representing 66% of all cases, while 221 were female, accounting for the remaining 34% (**Figure 11**).

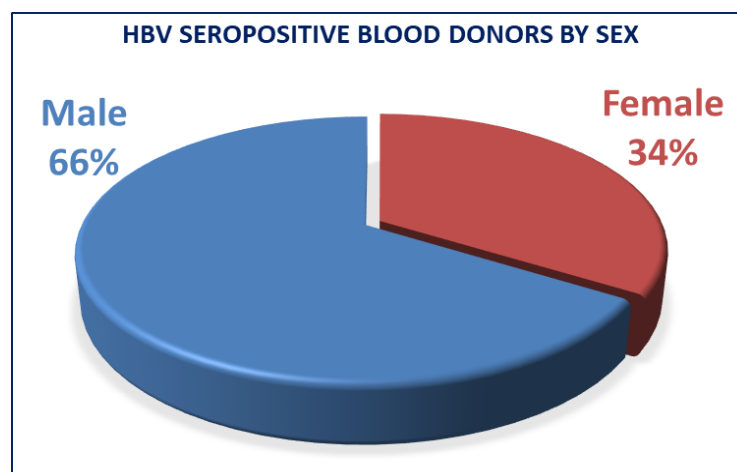


Figure 11: Distribution of HBV carriers by sex

A total of 137 people tested positive for HCV between 2020 and 2024. Out of the total positive cases, 108 were male, representing 79% of all cases, while 29 were female, accounting for the remaining 21% (**Figure 12**).

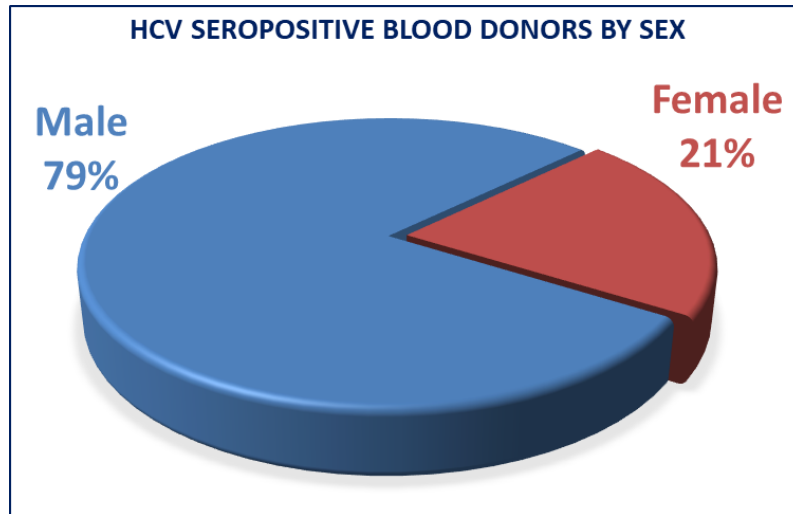


Figure 12: Distribution of HCV carriers by sex

There were 17 cases of HIV between 2020 and 2024. Of these, 15 were men, accounting for 88% of all cases, and 2 were women, accounting for 12% (**Figure 13**).

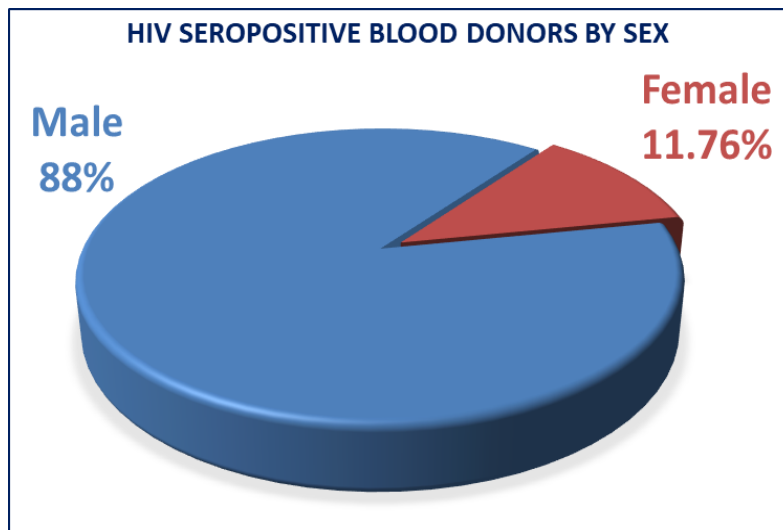


Figure 13: Distribution of Confirmed HIV by sex

3.4 Blood Donor Age and Infection Status

3.4.1 The association between HBV infection and the age of the infected person

The average age of HBV among 654 positive samples is 43.0 years. The most affected age group by HBV is 34-41 years, accounting for 32.9% of all cases, followed by the 42-49 age group with 24.5%, and then 50-57 years, which accounts for 22.6%. These three middle-aged groups make up 80% of all HBV infections, indicating that many adults in their working years are getting sick. In contrast, the 18–25 age group had the lowest percentage, with only 4.7% of cases. These results indicate that HBV appears to be more prevalent among older

individuals. This may be because they have been exposed to it more frequently over time, due to differences in vaccination rates, or because they were less aware of it in earlier generations. Table 16 below provides a summary of the distribution (Table 11).

Table 11: Number and Percentage of Confirmed HBV Cases by Age Group

	No. of Cases	Percentage
18 - 25	31	4.7 %
26 - 33	56	8.6%
34 - 41	215	32.9%
42 - 49	160	24.5%
50 - 57	148	22.6%
58+	44	6.7%
Total	654	100%

3.4.2. The association between HCV infection and the age of infected person

Table 12 shows that most cases were observed among donors aged 26-33 (28%), followed by the 34-41 age group (22%) and the 42-49 age group (22%). Then, the 50-57 age group had 18 cases, accounting for 13%. The lowest age group was above 58, with 5 cases making up 4%. The mean age of HCV was 38.4.

Table 12: Number and Percentage of Confirmed HCV Cases by Age Group

	No. of Cases	Percentage
18 - 25	15	11%
26 - 33	39	28%
34 - 41	30	22%
42 - 49	30	22%
50 - 57	18	13%
58+	5	4%
Total	137	100%

4.4.3 The association between HIV infection and the age of the infected person

Table 13 shows that donors between the ages of 26 and 33 were the most commonly infected, accounting for 41.2% of all cases. Donors aged 34 to 41 made up about 29.4% of the cases, while those between 18 and 25 contributed around 17.6%. With only 11.8% of cases among those aged 42–49 and no cases reported among donors aged 50 and above, the proportion declined as people aged. According to these results, HIV is much less common in older age groups and more common in younger and early-middle-aged donors. the mean age of HIV was 32.6.

Table 13: Number and Percentage of Confirmed HIV Cases by Age Group

	No. of Cases	Percentage
18-25	3	17.6
26-33	7	41.2
34-41	5	29.4
42-49	2	11.8
50 - 57	0	0%
58+	0	0%
Total	17	100%

The Chi-square test showed there is a meaningful link between the kind of infection and the age group of the donor. The numbers were $\chi^2 = 74.264$ with 8 degrees of freedom, and the p-value was less than 0.05, as shown in Table 14. This means that the number of HBV, HCV, and HIV infections was very different in different age groups. This suggests that certain age groups are more susceptible to specific infections than others. These results support the age-based patterns observed in the frequency distribution and visualizations. Figure 14 shows the distribution of the test results.

Table 14: Chi-Square Test Results for the Association Between Infection Type and Donor Age Group (2020–2024)

	Value	df	P-Value
Pearson Chi-Square	74.954 ^a	10	.000
Likelihood Ratio	68.376	10	.000
Linear-by-Linear Association	43.552	1	.000
N of Valid Cases	808		

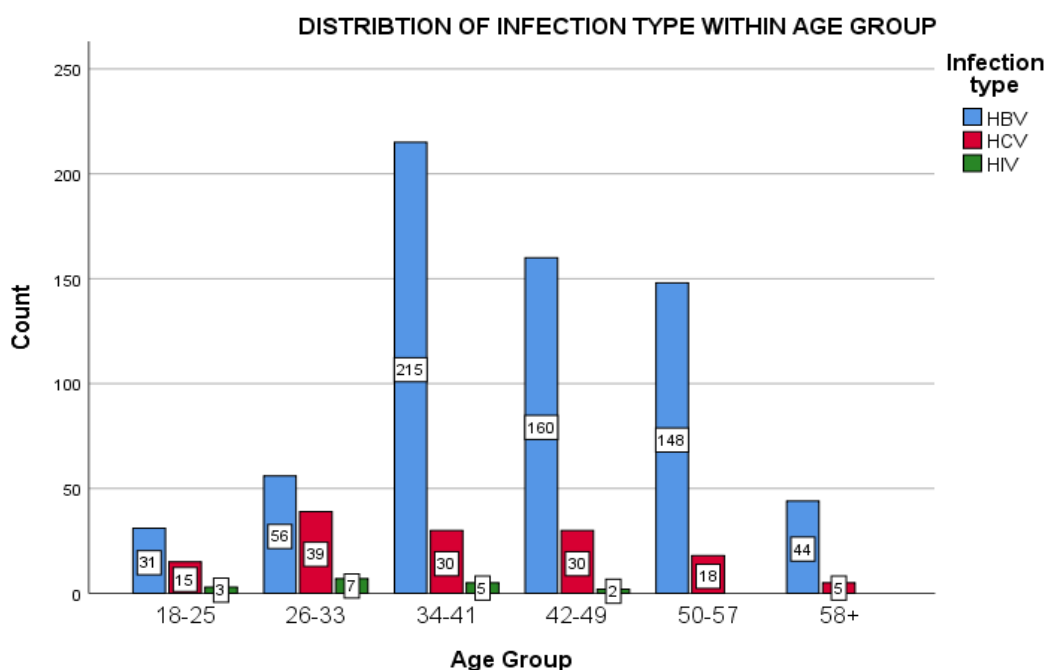


Figure 14: Distribution of Infection Type Within Donor Age Groups

4.5 Blood Donor’s Locality and Infection Status

A study examining the spread of infections in various settings (urban, rural, and camps) shows there are differences in how common HBV and HCV are in each area. 61% of HBV cases were in urban areas, followed by 35.5% and 35.3% in rural areas, and only 3.7% in camps. The same pattern was observed in HCV, with 59.1% in urban areas, 38% in rural areas, and 2.9% in camps. Unlike other donors who live in camps and rural areas, this result shows that donors who live in urban areas are more likely to have HBV and HCV. Many reasons can be related to this, including the population density in urban areas, differences in health, and lifestyle behaviors. The camp's limited access to testing and reliance on UNRWA health services may not be fully reflected in the data. There is no data reported about the HIV donors' residency.

A Pearson Chi-Square test showed there is no real connection between the location of the infection and its type. The numbers ($\chi^2 = 0.466$, $p = 0.792$) suggest that any differences seen are probably just random and not meaningful. Table 15 provides additional information on these results, and Figure 15 illustrates this result.

Table 15: Distribution of HBV and HCV Infections by Locality (Urban, Rural, Camp) Among Blood Donors (2020–2024), with Chi-Square Test Results

locality		Infection type			Pearson Chi-Square	P-Value	
		HBV	HCV	Total			
Urban	Count	399	81	480	.466 ^a	.792	
	% within locality	83.1%	16.9%	100.0%			
	% within Infection type	61.0%	59.1%	60.7%			
	Rural	Count	231	52			283
		% within locality	81.6%	18.4%			100.0%
		% within Infection type	35.3%	38.0%			35.8%
	Camp	Count	24	4			28
		% within locality	85.7%	14.3%			100.0%
		% within Infection type	3.7%	2.9%			3.5%
Total	Count	654	137	791			
	% within locality	82.7%	17.3%	100.0%			
	% within Infection type	100.0%	100.0%	100.0%			

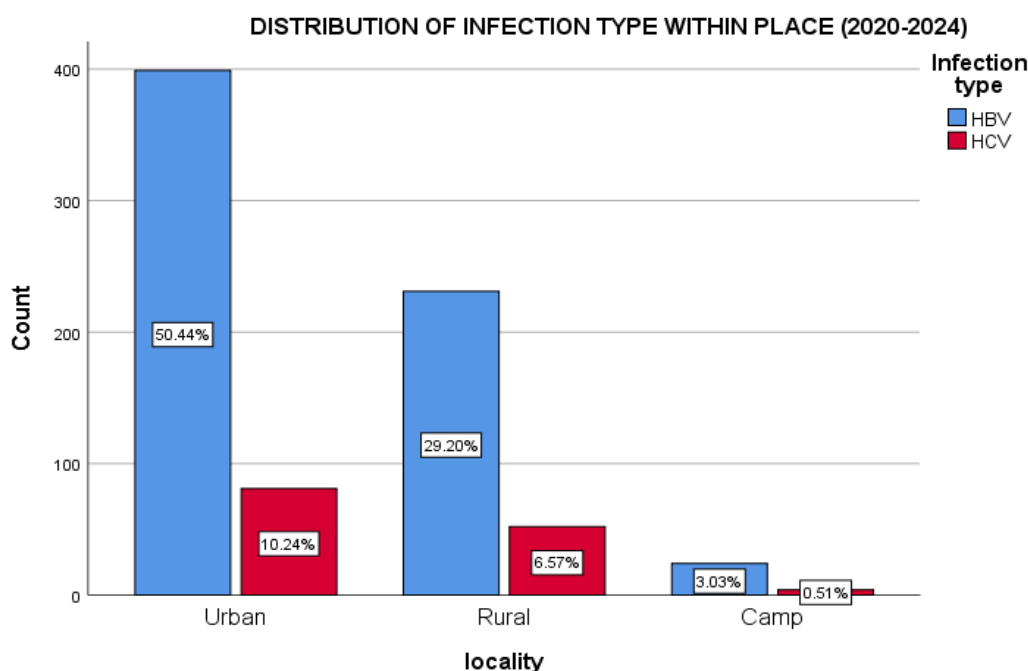


Figure 15: Distribution of HBV and HCV Infections by Locality (Urban, Rural, Camp) Among Blood Donors (2020–2024)

4.6 Blood Donor’s Governorate and Infection Status

The number of BBD varies from one West Bank governorate to another during the study period. The highest total number of infections, with 198 cases (24.5%), was in Hebron, followed by Jenin with 154 cases (19.1%) and Tulkarem with 123 cases (15.2%). Hebron had the highest number of HBV cases (22.3% of all cases), followed by Jenin (15.3%) and Tulkarem (12%). Bethlehem (3.8%), Jenin (3.5%), and Hebron (1.6%) had the highest number of HCV cases. There were not many HIV infections, but the highest rates were in Hebron (0.6%), Ramallah (0.2%), and Bethlehem and Jenin (0.2% each). Other governorates, such as Qalqilya, Tubas, Salfit, and Jericho, had fewer cases of all types of infections. Table 16 shows that these results indicate infections were not evenly distributed across the country, with some areas having higher concentrations, particularly for HBV.

Table (16-A): Distribution of HBV, HCV, and HIV Infections by Governorate Among Blood Donors (2020–2024)

Person governate		Infection type			Total
		HBV	HCV	HIV	
Bethlehem	Count	87	31	2	120
	% of Total	10.8%	3.8%	0.2%	14.9%
Hebron	Count	180	13	5	198
	% of Total	22.3%	1.6%	0.6%	24.5%
Jenin	Count	124	28	2	154
	% of Total	15.3%	3.5%	0.2%	19.1%

Table (16-B): Distribution of HBV, HCV, and HIV Infections by Governorate

Jericho	Count	13	2	1	16
	% of Total	1.6%	0.2%	0.1%	2.0%
Nablus	Count	40	7	2	49
	% of Total	5.0%	0.9%	0.2%	6.1%
Qalqyia	Count	2	0	1	3
	% of Total	0.2%	0.0%	0.1%	0.4%
Ramallah	Count	55	14	2	71
	% of Total	6.8%	1.7%	0.2%	8.8%
Salfit	Count	13	12	0	25
	% of Total	1.6%	1.5%	0.0%	3.1%
Tubas	Count	11	3	0	14
	% of Total	1.4%	0.4%	0.0%	1.7%
Tulkarem	Count	97	25	1	123
	% of Total	12.0%	3.1%	0.1%	15.2%
Yatta	Count	32	2	1	35
	% of Total	4.0%	0.2%	0.1%	4.3%
Total	Count	654	137	17	808
	% of Total	80.9%	17.0%	2.1%	100.0%

We used a Chi-square test to examine the relationship between the type of infection and the governorate. The results showed a clear connection, with a chi-square value of ($\chi^2 = 63.099$, $df = 20$, $p < .001$), indicating that the number of HBV, HCV, and HIV cases varied across different areas. Table 17 and Fig. 16 show all of the test results.

Table 17: Chi-Square Test Results for the Association Between Infection Type and Governorate (2020–2024)

	Value	df	P-Value
Pearson Chi-Square	63.099 ^a	20	.000
Likelihood Ratio	53.371	20	.000
Linear-by-Linear Association	.490	1	.484
N of Valid Cases	808		

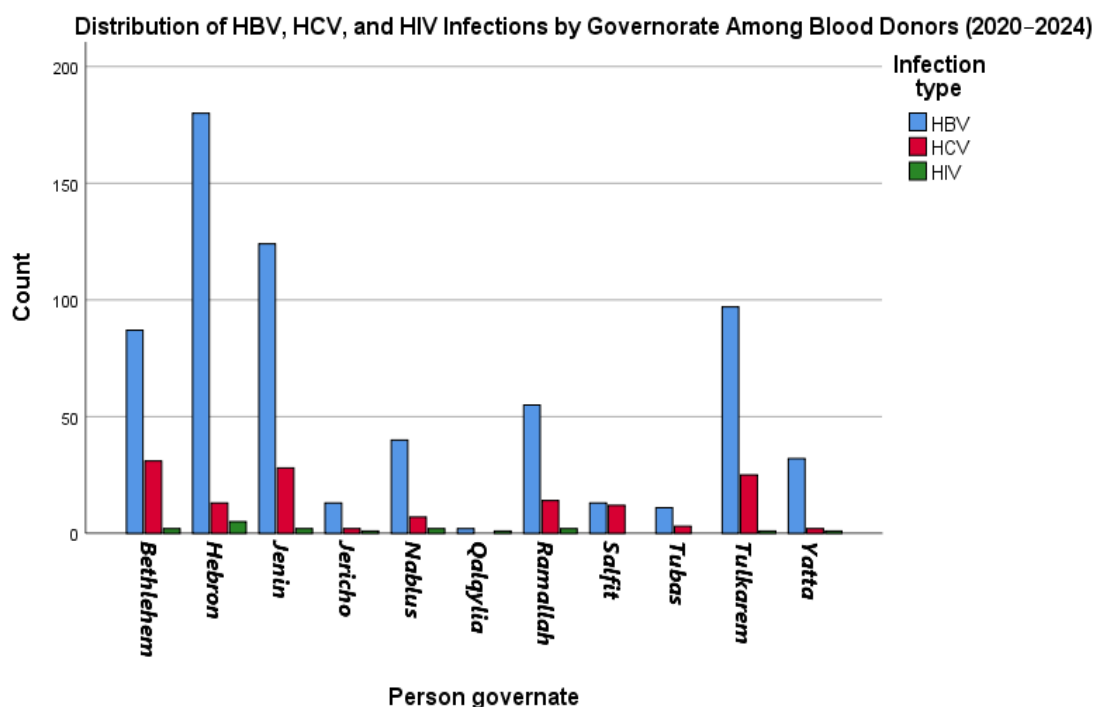


Figure 16: Distribution of HBV, HCV, and HIV Infections by Governorate Among Blood Donors (2020–2024)

4.7 Behavioral and medical factors contributing to the prevalence of HBV, HCV, and HIV among blood donors in the West Bank

This part is meant to answer research question number 3: "What are the medical and behavioral factors that make HBV, HCV, and HIV more common among blood donors in the West Bank?"

4.7.1 Medical Factors Analysis

This study examined a group of relevant variables to determine if any medical factors were associated with the prevalence of HBV and HCV. The data were available for just a few sample cohorts of 24 HBV cases and 5 HCV cases. The following is a summary of the descriptive profile of the HBV and HCV study population.

These cases were studied with various variables, including symptoms such as chills, fever, abdominal pain, vomiting, and the donor's governorate and occupation. As shown in Table 18, the dominant infection was HBV in 2020 (100%), 2023 (100%), and 2021 (70%), while HCV appeared in 2021 (30%), 2022 (25%), and was equally prevalent in 2024 (50%). Regarding occupation, workers were the most affected group (86.7%), followed by housewives (100%) and those not working (66.7%). In contrast, HCV was more common among the employed (66.7%). Most cases in Hebron, Salfit, and Yatta came from those governorates, each with 100%. Meanwhile, Ramallah had a higher rate of HCV, at 66.7%. Most of the HBV samples, about 95%, came from men, while just around 5% were from women. Conversely, 40% of the HCV samples were from females, and six HBV cases were from females, representing 60.0%. Regarding symptoms, HBV cases most commonly presented with abdominal pain (81.5%), chills (87%), dark urine (87%), and fever (81.5%). Since these results are based on a small sample and not the entire donor population, we

cannot generalize them, although the data suggest that HBV is widespread across these factors. These patterns might show differences in how people are exposed or the risks they take.

Table(18-A): Distribution of HCV and HBV by some sociodemographic factors and some symptoms

		infection type			
		HBV		HCV	
		Count	Row N %	Count	Row N %
Incident date	2020	5	100.0%	0	0.0%
	2021	7	70.0%	3	30.0%
	2022	3	75.0%	1	25.0%
	2023	8	100.0%	0	0.0%
	2024	1	50.0%	1	50.0%
Occupation (Career)	Worker	13	86.7%	2	13.3%
	Employed	1	33.3%	2	66.7%
	House Wife	6	100.0%	0	0.0%
	Not Working	2	66.7%	1	33.3%
	Other	2	100.0%	0	0.0%
Person District	Hebron	14	100.0%	0	0.0%
	Qalqilya	3	75.0%	1	25.0%
	Ramallah	2	33.3%	4	66.7%
	Salfit	4	100.0%	0	0.0%
	Yatta	1	100.0%	0	0.0%
Person Sex	Male	18	94.7%	1	5.3%
	Female	6	60.0%	4	40.0%
Abdominal Pain	Yes	10	90.9%	1	9.1%
	No	14	77.8%	4	22.2%
	Unknown	0	0.0%	0	0.0%
Chills	Yes	2	100.0%	0	0.0%
	No	22	81.5%	5	18.5%
	Unknown	0	0.0%	0	0.0%
Dark urine	Yes	4	66.7%	2	33.3%
	No	20	87.0%	3	13.0%
	Unknown	0	0.0%	0	0.0%
Fever	Yes	2	100.0%	0	0.0%
	No	22	81.5%	5	18.5%
	Unknown	0	0.0%	0	0.0%
Vomiting	Yes	0	0.0%	0	0.0%
	No	24	88.9%	3	11.1%
	Unknown	0	0.0%	2	100.0%
infection type	HBV	24	100.0%	0	0.0%
	HCV	0	0.0%	5	100.0%

4.7.2 Vaccination status

Among the 654 donors who tested positive for HBV, vaccination coverage was low, with only 12.2% of males and 15.4% of females reporting having been vaccinated. The majority of donors—87.8% of males and 84.6% of females—had not received the vaccine. Statistical analysis showed no significant association between vaccination status and sex ($p = 0.263$), region ($p = 0.427$), or place of residence ($p = 0.477$).

In contrast, age group and employment status were significantly associated with vaccination status. All vaccinated donors were aged 18–33 years; none of the donors aged 34 years or older reported receiving the vaccine ($p < 0.001$). Vaccination rates also varied by occupation ($p < 0.001$), with students (82.4%) and unemployed individuals (15.8%) having higher vaccination rates compared to full-time workers (7.4%) and part-time workers (12.7%). These findings indicate that younger donors and students were more likely to be vaccinated against HBV, whereas older donors and those in employment had much lower vaccination rates. Details are presented in Table 19 and illustrated in Figure 17 (by sex) and Figure 18 (by occupation).

Table(19-A): Association Between HBV Vaccination Status and Donor Characteristics (Sex, Age, Occupation, and Residence Type)

		HBV Vaccination Status of the Donor				Chi-square	P-Value
		Yes		No			
		Count	Row N %	Count	Row N %		
Sex of the Donor	Male	53	12.20%	380	87.80%	1.254	0.263
	Female	34	15.40%	187	84.60%		
Governorate of Residence of the Donor	Bethlehem	16	18.40%	71	81.60%	10.15	0.427
	Hebron	31	17.20%	149	82.80%		
	Jenin	13	10.50%	111	89.50%		
	Jericho	1	7.70%	12	92.30%		
	Nablus	5	12.50%	35	87.50%		
	Qalqyia	0	0.00%	2	100.00%		
	Ramallah	6	10.90%	49	89.10%		
	Salfit	3	23.10%	10	76.90%		
	Tubas	1	9.10%	10	90.90%		
	Tulkarem	9	9.30%	88	90.70%		
	Yatta	2	6.30%	30	93.80%		
Age Group	18-25	31	100.00%	0	0.00%	654	0
	26-33	56	100.00%	0	0.00%		
	34-41	0	0.00%	215	100.00%		
	42-49	0	0.00%	160	100.00%		
	50-57	0	0.00%	148	100.00%		
	58+	0	0.00%	44	100.00%		
Occupation Status of the Donor	worker	30	12.70%	206	87.30%	73.607	0
	Employed	2	7.40%	25	92.60%		
	House wife	10	10.10%	89	89.90%		
	unknown	27	11.10%	217	88.90%		
	Others	1	10.00%	9	90.00%		

Table (19-B): Association Between HBV Vaccination Status and Donor Characteristics

	self employed	0	0.00%	1	100.00%		
	not working	3	15.80%	16	84.20%		
	farmer	0	0.00%	1	100.00%		
	student	14	82.40%	3	17.60%		
Type of Residence Area	Urban	48	12.00%	351	88.00%	1.48	0.477
	Rural	35	15.20%	196	84.80%		
	Camp	4	16.70%	20	83.30%		

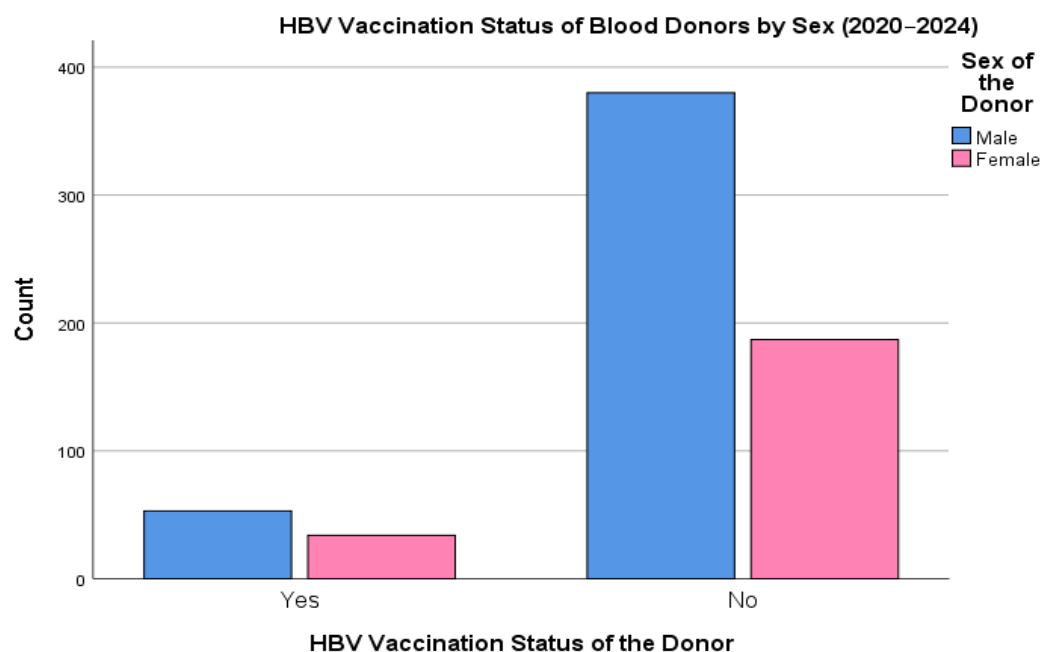


Figure 17: HBV Vaccination Status of Blood Donors by Sex (2020–2024)

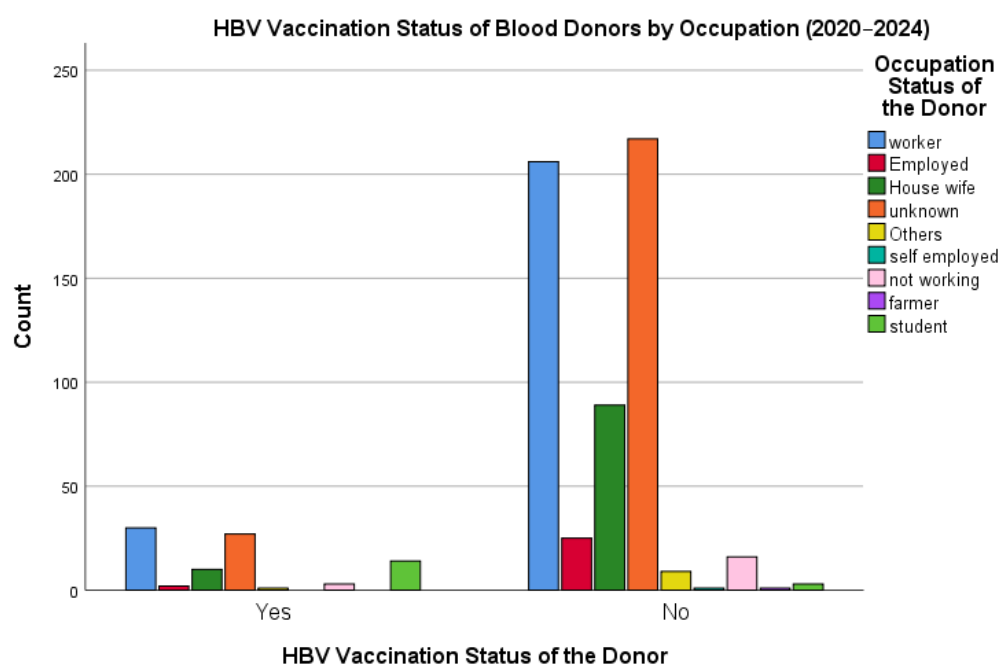


Figure 18: HBV Vaccination Status of Blood Donors by Occupation (2020–2024)

4.7.3 Hospitalization Status

None of the documented HBV or HCV cases in this study were reported as having been hospitalized during the course of their illness. While this may reflect the possibility that cases were mild and did not require inpatient care, it may also point to gaps in case management, such as incomplete reporting, limited referral pathways, or insufficient follow-up between primary healthcare providers and hospital-based services.

Effective coordination between disease surveillance units and secondary care facilities is essential to ensure timely referral and appropriate management for patients who require hospitalization. In some instances, patients may not access healthcare services due to lack of awareness, financial constraints, or other barriers. Additionally, the absence of standardized national guidelines for the management and follow-up of hepatitis B and C cases may contribute to inconsistencies in care.

Strengthening interdepartmental coordination, establishing clear referral and follow-up protocols, and ensuring smooth transitions from case detection to treatment are critical steps to improving the management of viral hepatitis in the West Bank.

4.7.4 Unsafe Blood Transfusions as a Primary Driver of HBV and HCV Transmission

BBDs can be transmitted through unsafe blood transfusions and through infections that remain undetected during donor screening. In this study, information on previous blood transfusion history—a recognized transmission route—was available for only 28 HBV-positive donors and 5 HCV-positive donors, limiting the strength of the analysis. As shown in Figure 19, 52.0% (14 out of 28) of HBV-positive donors and 20.0% (1 out of 5) of HCV-positive donors reported a history of blood transfusion. While the HBV proportion appears high within this small subset, the limited sample size should be interpreted with caution. Nonetheless, these findings highlight that prior blood transfusion remains a potential risk factor, particularly in settings where infection control and screening practices are not rigorously enforced.

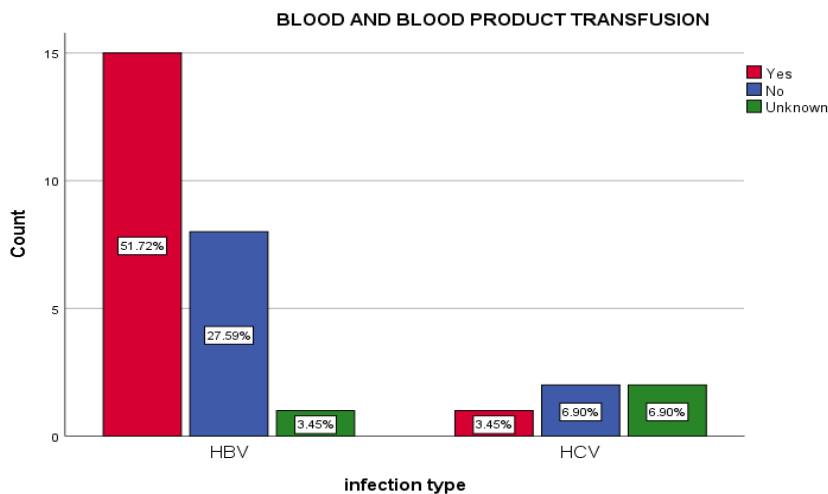


Figure 19: Blood and Blood Product Exposure as the Reported Transmission Route Among Seropositive Blood Donors

4.8 Behavior Factors Analysis

Along with clinical exposures, behavioral factors have a significant effect on the spread of Hepatitis B (HBV), Hepatitis C (HCV), and Human Immunodeficiency Virus (HIV), such as unprotected sex. HIV and HBV are straightforward to spread through sexual contact, especially if people do not know about them or take precautions.

4.8.1 Unprotected Sexual Activity

In this study, they recorded 17 HIV cases, and most of them—about 94%—were connected to unprotected sex. This shows that unsafe sexual behavior is the main way that HIV spreads. In contrast, only 4% of HBV cases were thought to be sexually transmitted. Sexual contact can spread HBV, especially if you have not been vaccinated, as shown in Figure 20. However, the low percentage in this sample may be due to underreporting, the fact that other modes of virus transmission, such as exposure to blood and blood products, are more common, or differences in how the virus spreads under various circumstances.

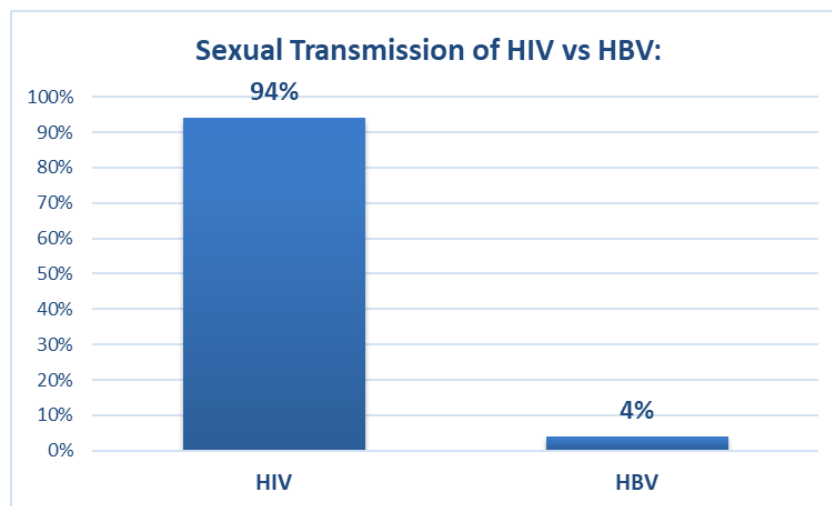


Figure 20: Proportion of Sexual Transmission Among HIV and HBV Cases

Table 20 presents the distribution of HIV transmission modes among infected blood donors by sex, governorate, marital status, vital status, and age group. Overall, heterosexual contact was the most frequently reported mode of transmission, accounting for 80.0% of male cases and 100.0% of female cases. Homosexual contact was reported only among males (13.3%), while drug injection was reported by a single male donor (6.7%).

By governorate, heterosexual transmission was predominant in all areas with reported cases. Homosexual transmission was reported in Jenin and Ramallah (50.0% each), while drug injection was reported only in Yatta (100.0% of its single case). Regarding marital status, heterosexual transmission was reported by both married (62.5%) and single (100.0%) donors. Homosexual transmission was reported among married donors (25.0%), and drug injection was reported by a small proportion of married donors (12.5%).

All cases among deceased donors (n=2) were due to heterosexual transmission. Among age groups, heterosexual contact was reported most frequently across 26–33 years (71.4%), 34–41 years (80.0%), and 42–49 years (100.0%). Homosexual contact was only reported in the 26–33 age group (28.6%), while drug injection was recorded only in the 34–41 age group

(20.0%). No HIV cases were reported among donors aged 50 years or older. Full details are presented in Table 20 and visually illustrated in Figure 21.

Table (20-A): Distribution of Risk Behaviors Among HIV-Positive Blood Donors by Demographic Characteristics (2020–2024)

		mode of transmission					
		Homosexual		Heterosexual		Drug addiction	
		Count	Row N %	Count	Row N %	Count	Row N %
gender of the Donor	Male	2	13.30%	12	80.00%	1	6.70%
	Female	0	0.00%	2	100.00%	0	0.00%
Governorate of Residence of the Donor	Bethlehem	0	0.00%	2	100.00%	0	0.00%
	Hebron	0	0.00%	5	100.00%	0	0.00%
	Jenin	1	50.00%	1	50.00%	0	0.00%
	Jericho	0	0.00%	1	100.00%	0	0.00%
	Nablus	0	0.00%	2	100.00%	0	0.00%
	Qalqyia	0	0.00%	1	100.00%	0	0.00%
	Ramallah	1	50.00%	1	50.00%	0	0.00%
	Salfit	0	0.00%	0	0.00%	0	0.00%
	tubas	0	0.00%	0	0.00%	0	0.00%
	Tulkarem	0	0.00%	1	100.00%	0	0.00%
	Yatta	0	0.00%	0	0.00%	1	100.00%
donor marital status	Married	2	25.00%	5	62.50%	1	12.50%
	Single	0	0.00%	9	100.00%	0	0.00%
Vital Status of the Donor	Alive	2	13.30%	12	80.00%	1	6.70%
	Dead	0	0.00%	2	100.00%	0	0.00%
Age Group	18-25	0	0.00%	3	100.00%	0	0.00%
	26-33	2	28.60%	5	71.40%	0	0.00%
	34-41	0	0.00%	4	80.00%	1	20.00%
	42-49	0	0.00%	2	100.00%	0	0.00%
	50-57	0	0.00%	0	0.00%	0	0.00%
	58+	0	0.00%	0	0.00%	0	0.00%

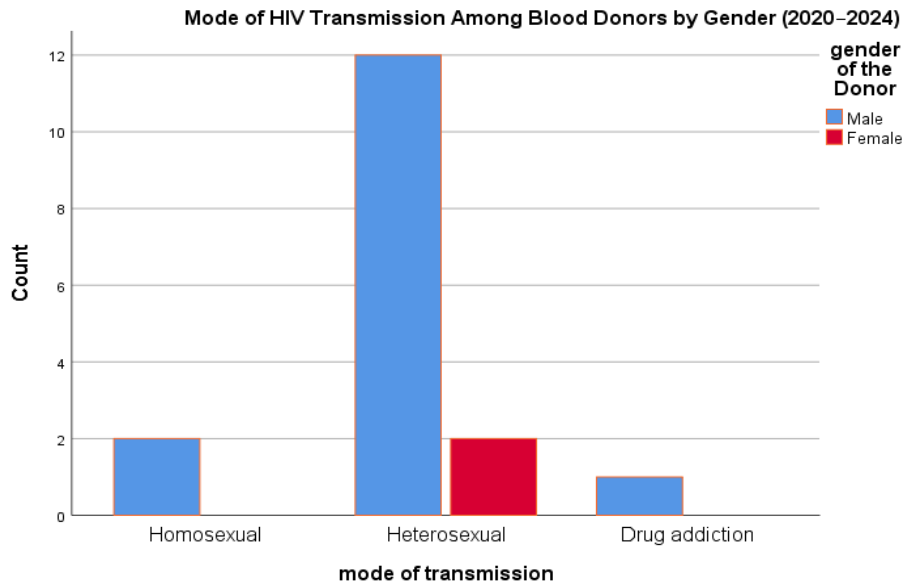


Figure 21: Mode of HIV Transmission Among Blood Donors by Gender

The findings highlight unprotected sexual behavior as a critical transmission pathway for HIV. These insights underscore the importance of integrating sexual health education and routine testing into public health interventions to reduce the burden of sexually transmitted infections, particularly in populations at elevated risk.

Chapter Five

Discussion

5.1 Discussion of Prevalence of Bloodborne Diseases (HBV, HCV, HIV, and Syphilis)

In this study, conducted between 2020 to 2024, the most common bloodborne disease among blood donors in the West Bank is HBV, accounting for 81% of all confirmed BBD cases. HCV made up 17%, and HIV represented 2% of the total. There are many reasons for the percentage difference. One of the main reasons is the vaccination rate of HBV, which is low because Palestine introduced the HBV vaccine to their immunization program in 1992, and most people were infected over 33 years ago; only 13.3% of positive donors in the study were vaccinated.

HBV is the most common bloodborne disease (BBD), but the overall rates of BBDs among blood donors in the West Bank are still low compared to other regions and countries. The study found that the rates of HBV (0.25%), HCV (0.053%), HIV (0.007%), and no syphilis cases during the study period are much lower than those reported in nearby countries. During the study period, there were no reports of syphilis.

The numbers in the West Bank are significantly lower compared to those in other countries. A study involving 3,733 blood donors in northern Riyadh, Saudi Arabia, showed that about 0.19% had hepatitis B (HBsAg), while around 0.32% had hepatitis C (Alqahtani et al., 2021). The HBV rate in Saudi Arabia is lower than that seen in the West Bank, at around 0.32%. The HCV rate is significantly higher, at 0.053%, compared to the other rate. The difference could be that since donors in Saudi Arabia are younger, NAT testing is more common, and follow-up programs are more organized, which helps identify infections earlier and reduces the overall spread.

A larger systematic review of TTIs in the Southern African Development Community (SADC) region found that the overall TTI rate was 2.0%. HBV was the most common, with a rate of 3.0%, followed by HIV and syphilis at 2.0% and HCV at 1.0% (Puerto-Meredith et al., 2023). These rates are significantly higher than those seen in the West Bank. High TTI rates in SADC countries are often blamed on replacement donations, a lack of screening infrastructure, and limited public health outreach, especially for first-time and rural donors.

Data from Israel, based on over 1.2 million blood donors, reported a relatively low prevalence of syphilis at approximately 47 cases per 100,000 donors. Among syphilis-

positive individuals, 8% were coinfecting with HIV, 1.88% with HCV, and 0.37% with HBV. Notably, immigrants from Africa and Eastern Europe exhibited substantially higher TTI rates compared to native Israelis (Vera et al., 2014). Migration history and prior life circumstances can significantly influence health outcomes. In comparison, the West Bank's prevalence of HCV (0.053%) and HBV (0.25%) is lower than the coinfection rates observed in Israel's infected donor subgroup, suggesting that TTI prevalence in Palestine remains relatively low despite limitations in its public health infrastructure.

5.2 Discussion of Sociodemographic Distribution

5.2.1 Discussion of Sex Distribution

In this study, 808 blood donors tested positive for at least one bloodborne infection, with the majority being male (68.8%) compared to female donors (31.2%). A combination of sociocultural, behavioral, and physiological factors may explain the higher proportion of infections among male donors. Men generally represent a larger share of the donor population, partly because women are more frequently deferred from donation due to low hemoglobin levels, pregnancy, or menstruation.

HBV was the most common infection, affecting 654 donors, of whom 66.2% were male and 33.8% were female. Males also predominated in HCV (78.8% of cases) and HIV (88.2% of cases). A chi-square test indicated a statistically significant association between donor sex and type of infection ($p = 0.003$), showing that infection distribution differed significantly between males and females.

In contrast to a study in North Shoa, Ethiopia, HBV was more common in males (2.8%) than in females, while HCV was more common in females (1.4%) than in males (1.2%). HIV is also common in males (1.2%) (Gebreyes et al., 2025). In another study in Cameroon, the male sex was an independent variable with a p -value < 0.05 of the significantly higher TTI rate (8.1%) (Le, 2021). These regional disparities are more likely due to the differences in screening procedures and risk behaviors among donors.

5.2.2 Discussion of Age Distribution

During the study period, from 2020 to 2024, the mean age of blood donors in the West Bank was 42.01. The most common age among 808 donors was 38. Bloodborne: The most common age group was 34-41 (30.9%), followed by 42-49 (23.8%), and then 50-57 (20.5%). These three groups made up almost 80% of all 654 HBV cases. It is important to note that the 18-33 age group accounts for only 13.3%. This means that the vaccination program in Palestine is effective.

In contrast to HCV, in HIV, the most common age group is 26-33; the percent of this age group in HCV is 28% followed by 34-41 (22%), and in HIV, the percent of the 26-33 age group is 41.2% followed by 29.4% for 34-41 age group and then 18-25 (17.6%). These patterns suggest that HCV is linked to long-term and work-related exposure, while HIV is more likely related to risky behavior in younger adults. These patterns are statistically significant ($p < 0.001$), which supports the link between the age group and the type of infection.

On the other hand, the donors in North Shoa, Ethiopia, have a mean age of 27.8 years, which is significantly younger than that of the West Bank. The rate of HBV is 8.3% in the donors

above 35 years, while in those aged between 18-25, the rate was 1.6% and 2.5 % for the 26-35 age group. This means that the rate in this group is lower than the rate in the group above 35 years (Gebreyes et al., 2025). Similarly, in Ethiopia, HCV and HIV were also more common in younger people (Le, 2021). There are no cases among donors over 35 years old, in contrast to the results in the West Bank. In Cameroon, too, donors older than 20 years are most likely to be positive for TTIs. These differences between regions may be due to variation in age distribution between donors. In the West Bank, the age group eligible to donate blood is between 18 and 60, so older donors are more likely to detect these infections because the donor pool is aging and the risks accumulate over time. On the other hand, in Ethiopia and Cameroon, younger donors may be exposed to earlier risk, which may be because of behavioral factors and non-restriction on sexual behaviors and IV drug use (Le, 2021) (Gebreyes et al., 2025)

5.2.3 Discussion of infected donors' locality

In this study, most bloodborne diseases in the West Bank were found among donors residing in urban areas. Specifically, 61% of HBV cases were in urban areas, followed by 35.3% in rural areas and 3.7% in refugee camps. For HCV, 59.1% of cases were in urban areas, 38% in rural areas, and 2.9% in camps. According to these results, the percentage is higher among donors who reside in urban areas. This is likely because urban areas have many blood donors and have more hospitals and higher risk behavior factors, such as unprotected sex and traveling to other social networks. In contrast, rural areas have fewer donors, limited health facilities, and smaller social circles. At the same time, camps are associated with a smaller number of people who live in and have limited access to tests or rely on UNRWA health services.

Additionally, the study in Cameroon found that the percentage of urban donors is 73.9%, while in rural areas, it is only 26.1% (Le, 2021). This study did not assess the prevalence of infection common in different areas, although data indicate that blood donation patterns differ between urban and rural areas. This may be due to a higher population density and improved detection.

5.3 Discussion of the infected donor's occupation

The most common group in the sample was workers, accounting for approximately 37%. This suggests that a significant number of infected individuals are employed, likely in manual or informal positions. 14.16% of the sample consisted of housewives, which aligns with the gendered distribution of unpaid domestic work. Students (2.5%), people who were not working (3.92%), and self-employed individuals (4.33%) were smaller groups. In contrast to the study in Cameroon (Le, 2021), the presence of students and self-employed individuals is 42% and 43.1%, respectively. In the West Bank, there is a lack of formal employment. A large portion of the general population works as manual laborers, in construction, trade, or semi-formal jobs, which are labeled as workers. Most of these workers are employed in Israel, so the workforce mainly consists of the labor force. In Cameroon, an informal sector allowed individuals to work as self-employed farmers and business owners. The economic structure plays an important role in the type of occupation.

5.4 Discussion of Vaccination Status

In this study, 654 cases of positive HBV were identified; 13.3% of these individuals were vaccinated, while 86.7% were not vaccinated, indicating that vaccinated individuals had fewer infections than the non-vaccinated. The HBV vaccine was introduced into the Palestinian vaccination program in 1992, so all people under 33 have taken the vaccine, and the older have not, as I mentioned above. In the age group, the most affected age groups are between 34-41 and 42-49, where a significant relationship exists between vaccination and age group ($p < 0.001$). Additionally, there is another statistically significant difference between vaccination and occupation ($p < 0.001$). The data show that students who were vaccinated are 82.4%, which is logically due to their age. While older and working donors were observed at high rates because they had not received the vaccine.

Similarly, a study in southern China (Ye et al., 2023) found that HBV rates were significantly lower in vaccinated donors, with 0.56 percent compared to non-vaccinated donors, with rates of 0.78 percent, and the p-value was <0.05 . This is indicated in the active vaccination program in the West Bank and China.

5.5 Discussion of behavioral factors

In this study, the percentage of 17 blood donors who have gotten HIV because of unsafe sex with an infected person is 94%, 15 of them were males, and two were females. This percentage is considered high; this could be attributed to a small sample size, which limited the generalization of this finding. The most predominant mode of HIV transmission is heterosexual, with an 86.7 percent prevalence, followed by 13.3 % homosexual transmission, and 6.7% by drug addiction. On the other hand, only 4% of HBV cases were thought to be spread through sex, and no cases were due to drug addiction. The result in HBV is low, which may be because of the vaccine. This percentage may be due to extensive travel and trade, and approximately 37 % of donors are workers, as workers in this group may be more exposed to these behavioral risk factors.

A study in Ghana (Osei-Boakye et al., 2024) on 1317 blood donors found that 16.7% of men and 6.8% of women had sex without protection. with a p-value of 0.045, the cultural and regional differences between Ghana and the West Bank may finally affect how people behave and report. These factors probably explain the difference in percentage and show that there needs to be a big, focused study on risk behavior to get a better idea of the percentage of sexually transmitted bloodborne diseases among donors.

In this study, the percentage of transmitted BBDs due to intravenous drug use (IVDU) is only one case (6.7%) among HIV-infected donors. There are no reported cases related to Hepatitis B and C. In contrast, a study in Israel found that IVDU was one of the major reasons for transmitting BBDs among donors, especially HCV (OR, 4.9; 95% CI, 2.4-10.2), along with close contact (odds ratio [OR], 7.2; 95% confidence interval [CI], 1.9-27.8) (Kerzman et al., 2007). The reason why this percentage is lower may be due to the small number of HIV cases, underreporting of HBV and HCV cases, and the blood bank questionnaire form that is given to donors before blood collection, which includes questions about drug use and addiction. They make them withdraw from the donation and make these cases undetectable.

Chapter Six

6. Conclusion

This study found that between 2020 and 2024, Hepatitis B Virus (HBV) was the most common bloodborne disease among blood donors in the West Bank, accounting for 81% of all confirmed BBD cases, while Hepatitis C Virus (HCV) made up 17% and Human Immunodeficiency Virus (HIV) represented just 2%. There are several reasons for this difference. One major reason is that vaccination rates in the past were low. For example, Palestine added the HBV vaccine to its national immunization program in 1992. However, most of the people who were infected in this study were over 33 and probably missed getting vaccinated as children. Only 13.3% of people with HBV in this study had been vaccinated, which shows that there are significant gaps in adult immunization coverage and follow-up, especially among older and working people.

HBV is the most common bloodborne disease (BBD), but the overall rates of BBDs among blood donors in the West Bank are still low compared to other regions and countries. The study found that the rates of HBV (0.25%) and HCV (0.053%) are much lower than those reported in nearby countries. During the study period, there were no reports of syphilis.

The prevalence rates in the West Bank are significantly lower than in other countries. For example, a study of 3,733 blood donors in Northern Riyadh, Saudi Arabia, found that 0.19% had HBV (HBsAg) and 0.32% had HCV (Alqahtani et al., 2021). The HBV rate in Saudi Arabia is slightly lower than the rate in the West Bank (0.32% vs. 0.053%), but the HCV rate is significantly higher. The difference could be that since donors in Saudi Arabia are younger, NAT testing is more common, and follow-up programs are more organized, which helps identify infections earlier and reduces the overall spread.

A larger systematic review of TTIs in the Southern African Development Community (SADC) region found that the overall TTI rate was 2.0%. HBV was the most common, with a rate of 3.0%, followed by HIV and syphilis at 2.0% and HCV at 1.0% (Puerto-Meredith et al., 2023). These rates are significantly higher than those seen in the West Bank. High TTI rates in SADC countries are often blamed on replacement donations, a lack of screening infrastructure, and limited public health outreach, especially for first-time and rural donors.

In contrast, data from Israel, based on 1.2 million blood donors, showed a low syphilis rate (47 per 100,000) and coinfection rates of 8% (HIV), 1.88% (HCV), and 0.37% (HBV) among positive donors. Interestingly, immigrants from Africa and Eastern Europe had much

higher TTI rates than native Israelis (Vera et al., 2014). This illustrates how migration and prior exposure can impact health. In this case, the West Bank's rates of HCV (0.053%) and HBV (0.25%) are lower than the rates of coinfection in Israel's infected donor subgroup. This supports the idea that Palestine has relatively low TTI rates, even though its public health infrastructure is not very good.

6.1 Recommendation of this study

- Positive HBsAg, anti-HCV, and anti-HIV results should be confirmed by the Ministry of Health (MOH) upon notification.
- The Palestinian Preventive Medicine Department should investigate reported positive HBsAg and anti-HCV cases.
- Surveillance of positive BBD cases should be improved by ensuring complete information is available.
- BBD counseling for risk factors should be seriously implemented for donors before donation.
- HIV-positive cases identified by blood banks should be reported only after confirmation by the Preventive Medicine Department.
- Preventive medicine and blood banks should have the same number of notifications and reported cases of positive BBDs.
- Training for blood bank staff should be conducted, focusing on epidemiology and analysis of BBD.
- Community awareness of risk factors related to BBD should be raised, both in general and among vulnerable groups (e.g., IDUs, STD patients, HIV-positive individuals, etc.).

6.2 Recommendations for Future Research

- Future studies should collect data from both positive and negative donors to better understand the links between risk factors and infection.
- Conduct qualitative research by utilizing interviews and focus groups to gather insights into donors' knowledge, perceptions, and actions regarding TTIs and strategies for prevention.

6.3 Limitation of the Study

- The Ministry of Health has distributed a standardized national policy to all partners, including UNRWA, private sector hospitals, and NGOs; however, variations in counseling, reporting, and notification practices between governmental and non-governmental facilities still exist.
- COVID-19, the Gaza War, and political instability in the West Bank (e.g., checkpoint closures and curfews) affected the number of donors during the study period (2020–2024).
- Lack of risk factor investigation by the Preventive Medicine Department (MoH).
- Socioeconomic barriers, such as poverty, lack of tourism, and unemployment, mean that government staff receive only 50% of their salaries in theory. These factors

contributed to increased malnutrition, including anemia, resulting in a higher number of anemic patients being rejected by blood banks.

6.4 Budget of the study

Total cost for the study			
Expense study description	Number of units	Cost of each unit	Total cost
Transportation	13	200	2600 ILS
Data analysis/Software/ printing			3000 ILS
Miscellaneous			2000 ILS
Total			7600 ILS

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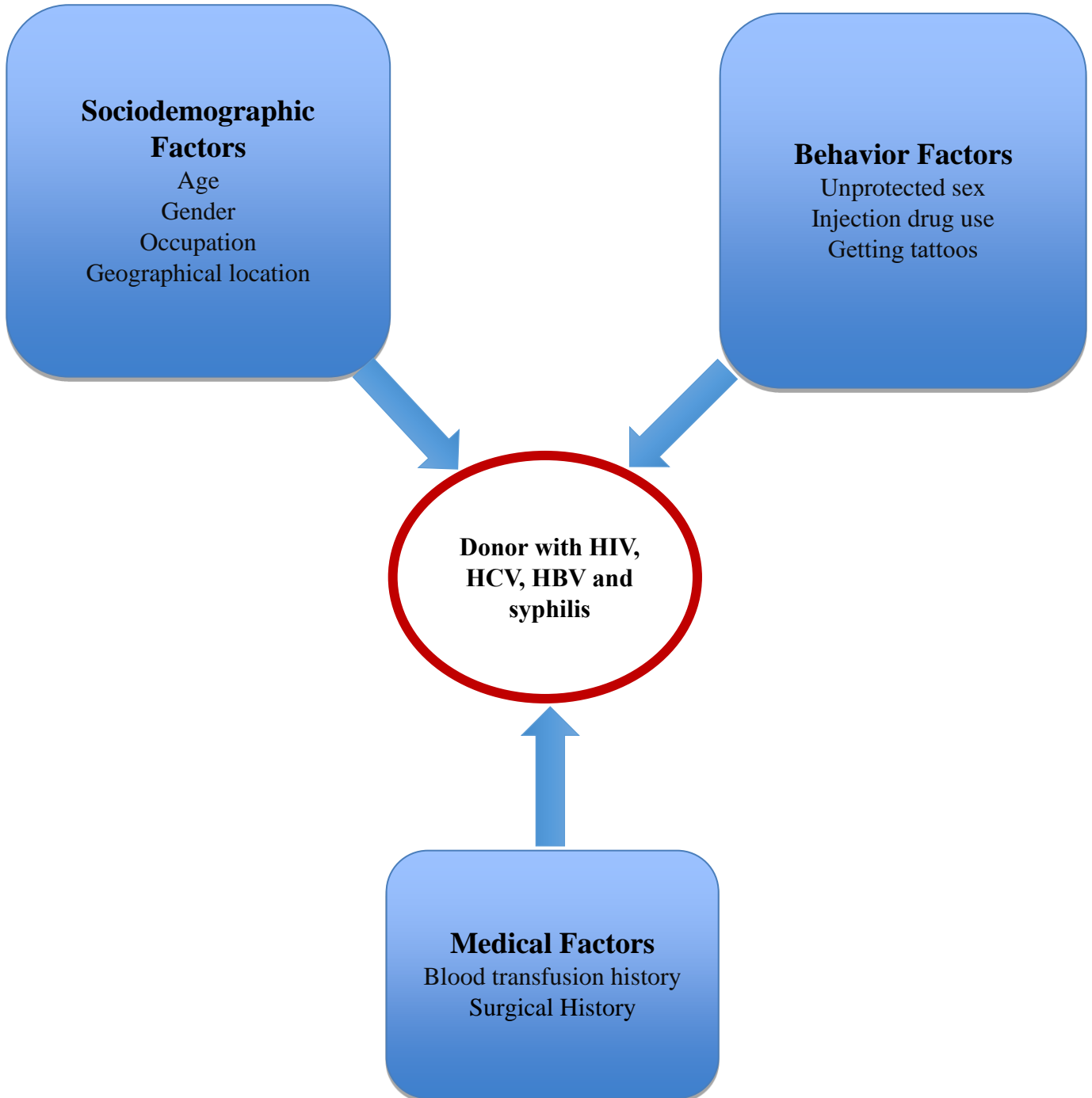
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<https://doi.org/10.1016/j.diagmicrobio.2025.116691>

Appendix

Structural Framework



Annex (1): IRB Approval

Al-Quds University
Jerusalem
School of Public Health



جامعة القدس
القدس
كلية الصحة العامة

التاريخ: 4/2/2025
الرقم: REF.1/25

عزيرتي الطالبة نور نواورة المحترمة
برنامج ماجستير الوقاية وضبط الامراض المعدية

الموضوع: موافقة لجنة اخلاقيات البحث العلمي

قامت اللجنة الفرعية لأخلاقيات البحث التابعة لكلية الصحة العامة بمراجعة مشروع الرسالة بعنوان:
"*Prevalence and Risk Factors of Bloodborne Diseases Among Blood Donors in the West Bank (2020–2024)*"

المقدم من (مشرف البحث/د. اسعد رملوي).

يعتبر مشروعك مستوفياً لمتطلبات أخلاقيات البحث في جامعة القدس.

نتمنى لكم كل التوفيق في تسيير المشروع.

ملاحظة: في حالة الحاجة الى موافقة من اللجنة المركزية في الجامعة، تستطيع التقدم باستخدام هذه الموافقة

على الرابط: <https://research.alquds.edu/en/ethics/48-how-to-apply.html>

رئيسة اللجنة الفرعية لأخلاقيات البحث
كلية الصحة العامة
د. نهى الشريف



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ص.ب. 51000 القدس

Annex (2): Facilitate the task

State of Palestine
Ministry of Health
Education in Health and Scientific
Research Unit

دولة فلسطين
وزارة الصحة
وحدة التعليم الصحي
والبحث العلمي

Ref.:
Date:.....

تم: ٢٠٢٤/٠٩/١٦
تاريخ: ٢٠٢٤/٠٩/١٦

عطوفة الوكيل المساعد لشؤون الصحة العامة وصحة الاسرة المحترم،،،
تحية واحترام،،،

الموضوع: تسهيل مهمة بحث

يرجى تسهيل مهمة الطالبة: نور نواورة - برنامج ماجستير الوقاية وضبط الامراض
المعدية- جامعة القدس، تحت اشراف د. أسعد رملوي، في عمل بحث بعنوان:

Prevalence and Risk Factors of Bloodborne Diseases Among Blood Donors in the
West Bank (2020–2024)

من خلال السماح للطالبة بجمع المعلومات تتعلق بمرضى التهاب الكبد الفيروسي والوبائي
والزهري ونقص المناعة المكتسبة (الايدز)، بين المتبرعين بالدم، والتي ستم دون مقابلة مرضى
او الاطلاع على اسمائهم او اية معلومات تعريفية لهم فقط من خلال مدير دائرة الطب الوقائي
في وزارة الصحة.

على ان يتم الالتزام باساليب واخلاقيات البحث العلمي، والحفاظ على سرية المعلومات.
على ان يتم تزويد الوزارة بنسخة PDF من نتائج البحث، التعهد بعدم النشر لحين الحصول على موافقة
الوزارة على نتائج البحث.

مع الاحترام،،،

دولة فلسطين
رئيس وحدة التعليم الصحي والبحث العلمي
وحدة التعليم الصحي والبحث العلمي

نسخة: عميد الصحة العامة المحترم/ جامعة القدس

Telfax.:09-2333901 scientificresearch.dep@gmail.com تلفاكس: 09-2333901

Annex (3): Collected data forms

Communicable Disease Notification Form

Patient Name:

Date of Birth: / /

Gender: Male Female

ID Number:

Phone Number:

Governorate:

Place of Residence:

Occupation:

School Name (if applicable):

Diagnosis:

Laboratory Findings:

Date of Disease Onset: / /

Treating Physician's Name:

Hospital Name (if admitted):

Additional Notes:

Date: / /

Reporting Physician's Name and Signature:

HIV/AIDS Investigation Form

1. Patient Information:

Name: ID No.:

Age: Sex: Occupation: Marital Status:

Address/Street: Area:

Work or school name and address: Phone:

Resident: Yes No If No, Original Residency:

Religion: Place of Birth: Years of Education:

2. Epidemiological Data:

Date of Entrance to Country: Countries visited before:

Place: From: To:

Place: From: To:

Type of work in the last 10 years:

Place of present work:

Sexual Behavior: Homosexual Heterosexual Bisexual Unknown

I.V. drug use: Yes No If yes, what: 1. When:

2. When: 3. When:

Hemophilia: Yes No

History of blood transfusion: Yes No

Hospital Name	Date	No. of Doses	Type of Transfusion	Reason
---------------	------	--------------	---------------------	--------

.....

Blood donation: Yes No If yes,

Place of Donation: Date:

3. Clinical Data:

Present Disease:

Date of Onset: / / Date of Presentation: / /

Was this patient hospitalized? 1=Yes 2=No (if yes)

Name of Hospital: Department: Dr. Name:

Date of Hospitalization: / /

Period of stay from: to

Previous Hospitalization: Yes No If Yes,

Date	Hospital	Department / Diagnosis
...

Symptoms and Signs:

Loss of Weight: Yes No Generalized Lymphadenopathy: Yes No

Tuberculosis: Yes No Recurrent Chest Infection: Yes No

Chronic Diarrhea: Yes No Prolonged Fever: Yes No

Skin Infection: Yes No Kaposi Sarcoma: Yes No

Others: Yes No If yes, specify:

4. Laboratory Data:

Type	Result	Date	Lab Name
HIV Elisa
Western Blot
PCR

5. House Information:

Health Status of Family Members:

No.	Name	Relationship	Health Status
1
2
3
4
5
6
7
8
9
10

6. Patient Outcome:

Treatment:

Present Condition: Still alive Died

If Died: Date of Death: Place of Death:

Autopsy Result:

Viral Hepatitis Investigation Form

Patient Information:

Name: ID:

Age: Sex: Occupation: Marital Status:

Address/Street: Area: Phone:

Work or School Name and Address:

Resident: Yes No If No, Original Residency:

Date of Illness:

Was the Patient Hospitalized: Yes No If yes, Name of Hospital:

Period of Stay: from to Outcome: Cured / Died / Unknown

Clinical Picture

Fever: Yes No Chills: Yes No

Vomiting: Yes No Abdominal Pain: Yes No

Jaundice: Yes No Dark Urine: Yes No

Others: Yes No If yes, specify:

Laboratory Test

Chemistry

Immunology

SGOT	Anti-HAV IgM
SGPT	HBsAg
Serum Bilirubin	Anti HBcIgM
1. Direct	Anti-HBc Total
2. Total	Anti HBeAg
P. T	Anti HCV
P.T. T	Others (Specify)
Others (Specify)	

Diagnosis:

Hepatitis A Hepatitis B Hepatitis C Others

Immunization:

Was the patient vaccinated for Hep B? 1 = Yes 2 = No 3 = Unknown

If yes, how many doses? 1 dose 2 doses 3 doses

Hygiene:

	Good	Fair	Bad / Unknown
Environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
House	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Source of Water:

Pipes: 1 = Yes 2 = No

Rain: 1 = Yes 2 = No 3 = Others:

Household Contacts:

Serial No	Name	Age	Relation to patient	Sex	Hep. Vaccination (If yes, No. of Doses / No)	If you suffer from Jaundice (Yes / No)
...
...
...
...
...

Preventive Measures Taken:

.....

Suspected Source of Infection:

Oral Fecal: Yes No Unknown

Blood & Blood Product: Yes No Unknown

Sexual Contact: Yes No Unknown

Vertical Transmission: Yes No Unknown

Name of Investigator: Signature:

Name of Preventive Medicine Dr.: Signature:

عنوان الرسالة

الانتشار وعوامل الخطر للأمراض المنقولة عبر الدم بين المتبرعين بالدم في الضفة

الغربية (2020-2024)

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الملخص

الخلفية: تُعدّ بنوك الدم من المكونات الأساسية لنظام الرعاية الصحية، ويعتمد المرضى الذين يحتاجون إلى نقل الدم على المتبرعين بالدم. ومع ذلك، قد يُشكّل الدم خطرًا على المتبرعين والعائلات والمتلقين والمجتمع. تُعدّ الأمراض المنقولة بالدم، مثل التهاب الكبد الوبائي ب، ج، وفيروس نقص المناعة البشرية، والزهري، من بين الأمراض الشائعة التي تنتقل عبر طرق مختلفة. غالبًا ما لا تظهر هذه العدوى أعراضًا لدى المتبرعين، مما يجعلها تهديدًا خفيًا للمتلقين والصحة العامة. تُشكّل الأمراض المنقولة بالدم مصدر قلق كبير عندما يتعلق الأمر بنقل الدم. ولذلك، غالبًا ما تُجري بنوك الدم والدوائر الصحية فحوصات للكشف المبكر عن أي عدوى. يواجه ملايين الأشخاص حول العالم كل عام خطر الإصابة بالعدوى التي يُمكن أن تنتشر عن طريق نقل الدم. ومع ذلك، لا توجد أبحاث كافية حول انتشار هذه الحالات بين المتبرعين بالدم في فلسطين.

المنهجية: تم إجراء دراسة جماعية استيعابية في دائرة الطب الوقائي الحكومية في الضفة الغربية – فلسطين، خلال الفترة من عام 2020 إلى عام 2024، بهدف تحديد مدى انتشار الأمراض المنقولة بالدم بين المتبرعين بالدم وتحليل العوامل الديموغرافية والسلوكية والطبية المرتبطة بها.

النتائج: بلغ إجمالي عدد المتبرعين من عام 2020 إلى عام 2024، 259,998 متبرعًا، منهم 808 مصابين بأمراض منقولة بالدم. وبلغت نسب انتشار فيروس التهاب الكبد ب، وفيروس التهاب الكبد ج، وفيروس نقص المناعة البشرية، والزهري 0.025%، و0.053%، و0.007%، و0% للزهري على التوالي. وكانت العدوى الأكثر شيوعًا هي فيروس التهاب الكبد ب (81%)، يليه فيروس التهاب الكبد ج (17%)، ثم فيروس نقص المناعة البشرية (2%). وكان الرجال وسكان المناطق الحضرية أكثر عرضة

للإصابة بالعدوى. أما بالنسبة لفيروس التهاب الكبد ب، فقد كانت الفئة العمرية الأكثر شيوعًا بين المتبرعين 34-41 عامًا، بينما كانت الفئة العمرية الأكثر شيوعًا لفيروس التهاب الكبد ج (26-33 عامًا)، وفيروس نقص المناعة البشرية (26-33 عامًا). وقد وُجدت صلة قوية بين نوع العدوى والفئة العمرية ($p < 0.001$) والجنس ($p = 0.003$). كان الاتصال الجنسي غير الآمن سببًا في 94% من حالات الإصابة بفيروس نقص المناعة البشرية، مع انخفاض معدل التطعيم ضد فيروس التهاب الكبد ب (13.3%).

الاستنتاج: أظهرت الدراسة أن معدلات الإصابة بفيروس التهاب الكبد ب وفيروس التهاب الكبد ج وفيروس نقص المناعة البشرية لدى المتبرعين بالدم في الضفة الغربية منخفضة بشكل مفاجئ، ولم تُبلغ عن أي حالات إصابة بمرض الزهري. ومن المثير للاهتمام أن الرجال وسكان المدن والمتبرعين في منتصف العمر كانوا أكثر عرضة للإصابة بالعدوى. ويبدو أن الطرق الرئيسية لانتشار هذه الأمراض هي من خلال التعامل غير الآمن مع الدم وممارسة الجنس غير الآمن. وبشكل عام، يبدو أن هناك مجالًا للتحسين في جهود التطعيم للبالغين الذين تزيد أعمارهم عن 33 عامًا، وإجراءات السلامة، وفحوصات المتابعة لتعزيز السلامة العامة.

الكلمات المفتاحية: الأمراض المنقولة عن طريق الدم، فيروس التهاب الكبد (HBV) B، فيروس التهاب الكبد (HCV) C، فيروس نقص المناعة البشرية (HIV)، الزهري، المتبرعون بالدم، الانتشار، عوامل الخطورة.