

PREVELANCE OF HIV AND SYPHILIS IN VOLUNTARY BLOOD DONORS BELONGING TO DISTRICT FAISALABAD PUNJAB, PAKISTAN IN 2025

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Abstract

The purpose of the study was to estimate the prevalence and co-infection of HIV and syphilis among voluntary blood donors Faisalabad and measure the efficacy of current screening procedures. Blood transfusion plays an important role in the contemporary healthcare system particularly in surgical, trauma, obstetric, and hematological procedures. Inadequate regulation, the excessive use of serological testing, and the propensity to continue using replacement donors, however, compromise the safety of transfusions in low- and middle-income countries, such as Pakistan. The absence of central regulatory measures has led to the variability of screening procedures, which poses a greater chance of transfusion-transmissible infections (TTIs) associated with HIV and syphilis. A cross-sectional analytical study was done in three tertiary care hospitals in Faisalabad, selected by theories like 250 voluntary male blood donors aged 20-35 years through systematic sampling had been studied. The ELISA and Rapid plasma reagin (RPR) methods used in the screening of HIV and syphilis were standardized and other information was gathered via administration of structured questionnaires on evaluation of demographic, socioeconomic, and behavioral risk factors. The outcomes indicated that syphilis was more prevalent than HIV, and the prevalence of co-infection was rare. Out of 226 tested donors, 44.25% of the donors were positive to at least one TTI, such as 28.76% toward syphilis and 15.48% toward HIV. Marital status, employment, medical history, and knowledge about TTIs were related to infections. The public sector blood banks had less consistent screening practices than those in the private sector. The results emphasise the necessity to introduce NAT screening across the country, standardised NAT practice requirements, and enhanced donor education to elevate the rate of safety in transfusions in Pakistan

INTRODUCTION

A blood transfusion is a medical process in which entire blood or components such as red blood cells, platelets, plasma, or cryoprecipitate, are transferred from a donor to a recipient via intravenous (IV)

infusion (Booth et al., 2025). Modern healthcare depends critically on blood transfusions, which help to cure anemia, severe blood loss, trauma, surgical operations, and hematological diseases, including

thalassemia and haemophilia. Timely blood transfusions save millions of lives annually, making them an essential medical operation. Blood transfusions provide major therapeutic advantages as well as major health hazards, including the spread of infectious illnesses from donors to receivers. Rigid donor selection, effective screening technology, and adherence to international transfusion guidelines define the safety of transferred blood (Ince, 2017).

When screening does not work as intended, blood recipients are at increased risk of acquiring transfusion-transmissible infections including HIV, syphilis, HBV, and HCV. The possibility of Transfusion-Transmitted Infection (TTI) transmission remains high when regulation oversight and blood test techniques are outdated. High-income nations successfully manage TTIs by testing all blood donations through nucleic acid technology, following strict donor entry rules, and maintaining strong safety monitoring systems. Current serological methods such as enzyme-linked immunosorbent assay (ELISA) and rapid plasma regain (RPR) testing for blood banks in Pakistan do not find early-stage infections and need improvement (Javed et al., 2022). Blood banks in different areas run their screenings differently. Despite these differences, the quality of detection of disease is affected (Bhatti et al., 2022).

Transfusion-transmissible infections (TTIs) are infectious illnesses that provide great danger to recipients through contaminated blood transfusions. Among the most alarming diseases in transfusion medicine, TTIs comprise viral, bacterial, and parasitic pathogens including Human Immunodeficiency Virus (HIV), syphilis, hepatitis B (HBV), and hepatitis C (HCV) (Bloch, 2022). In underdeveloped countries, where screening processes are often insufficient, TTIs affect a larger portion of the population. The prevalence of TTIs among blood donors is a global phenomenon and varies based on screening protocols, donor recruitment strategies, and healthcare infrastructure. Strict donor eligibility and universal nucleic acid testing (NAT) in high-income countries have led to the successful minimization of TTI transmission, and the risk of donor undetected infection entering the blood supply has been greatly reduced (Fong, 2020). However, many countries with developing economies still depend on serological tests of enzyme-linked immunosorbent assay (ELISA) and

the rapid plasma regain (RPR) test, which are low yield in determining the infections at initial phase (Nasrallah et al., 2023).

Human Immunodeficiency Virus (HIV) is a retrovirus that attacks the immune system, specifically targeting the CD4 cells (T helper cells). When the immune system is severely compromised, HIV will lead to the life-threatening condition of acquired immunodeficiency syndrome (World Health Organization, 2024). Blood transfusion continues to play a major role in HIV transmission, particularly in countries where screening is not or is no longer adequate or reliable. 39.9 million People worldwide live with HIV as of 2023, making this a long-standing persistent global burden of the virus (WHO, 2023a). Current medical care heavily depends on blood transfusion operations because nurses use them to treat severe anemia patients as well as assist in surgical treatments for trauma victims and deliver safe births while managing blood disease conditions. Blood transfusion practices developed during the 20th century have improved patient results because of progress in blood banking technology (Jones et al., 2020). Blood transfusion safety needs ongoing protection, especially in developing countries, because their inconsistent safety procedures and monitoring programs do not match global standards (Custer et al., 2018). Around 118.54 million blood donations are made globally, and 40% of these are gathered in wealthy nations that are home to 16% of the world's population. A total of 106 million contributions have been reported by over 13,300 blood centers throughout 169 countries. Compared to 25,700 in high-income countries, the median yearly donations per blood center are 1,300 in low-income countries, 4,400 in lower-middle-income countries, and 9,300 in upper-middle-income countries (WHO, 2023c). The prevalence levels of TTIs among blood donors differ consistently throughout various regions because of how healthcare infrastructure combines with donor recruitment methods and screening technologies. The occurrence rate of syphilis is 0.7%, which occurred more frequently than HIV at 0.3%, thus demonstrating the need for extensive TTI screening (Mejía Domínguez et al., 2024). Blood donor data from a regional blood bank in rural southwestern Uganda was analyzed retrospectively, and a rate of transfusion transmissible infection (TTI) of 5.67

percent was found. The HIV prevalence rate was 1.03, HBV 1.87%, HCV 2.22%, and for syphilis, it was 0.54%. The need for improved screening protocols will improve transfusion safety and reduce the risk of undetected infections (Apecu et al., 2017). Like many developing countries, Pakistan is also confronted with the variability of TTI prevalence among blood donors as blood banks differ in their screening methodologies and rely on replacement donors and inconsistent donor screening. In addition, the country does not have a centralized hemovigilance system, making it challenging to map post-transfusion infections and track TTI trends (Saba et al., 2021). Different prevalence rates of HIV and syphilis have been reported from different cities in Pakistan in various studies conducted on the blood donor population. In Islamabad, a study was conducted in 2012 according to which HIV prevalence was 0%, and syphilis prevalence was 0.89%, differing by region (Pak et al., 2012). A study conducted in Karachi showed some unusual results. According to this study, blood donors developed an HIV prevalence of 0.04% against the syphilis prevalence of 2.1% (Arshad et al., 2016). Thus, the research objective will be to determine the seroprevalence of HIV and syphilis in

2025 drawn free-of-charge blood donors of Faisalabad, examining relevant demographic parameters. In this way, it will help improve blood safety measures, aid informed public health interventions, and further inform the overall perspective on the trends in TTI in the Punjab area.

MATERIAL AND METHODS: The prospective observational study among 4 public, 3 private and 2 stand-alone blood banks was carried out. a period of the duration of 8 months i.e. 1 September 2024 to 30 April 2025. The selection of donors (n=226) was achieved through the WHO guidelines. All the blood donors had their informed consent. These 226 samples were collected according to the recommendations of National Committee for Clinical Laboratory studies (NCCLS) as shown in (Figure A). Clotted blood was used as a source of serum. ELISA was used to determine screening of surface antigen, Anti-HIV as shown in (Figure B). Rapid plasma reagin (RPR) was used to screen Syphilis as shown in (Figure C). Samples that showed positive infection were further analyzed by testing the same technique on the same sample again.

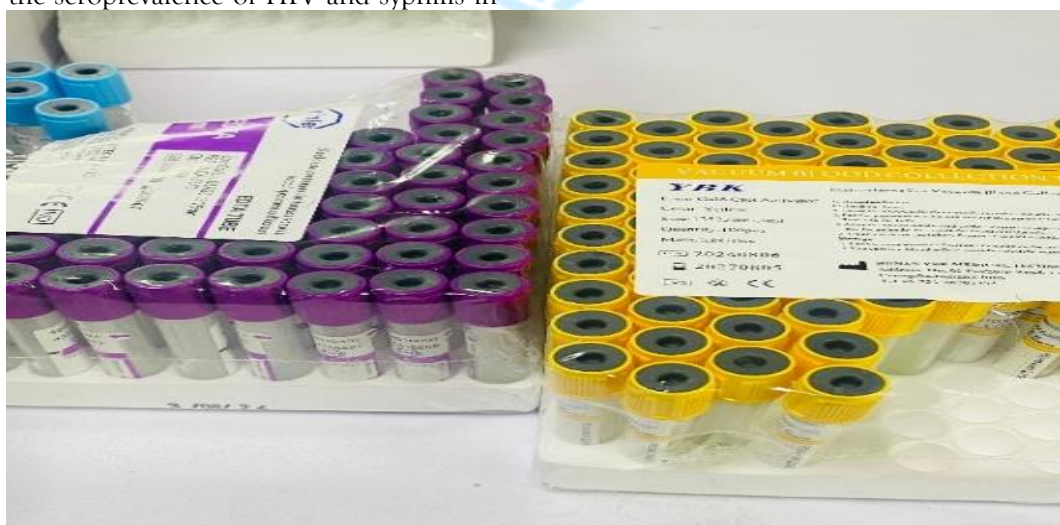


Figure A: Vacuum blood collection tubes

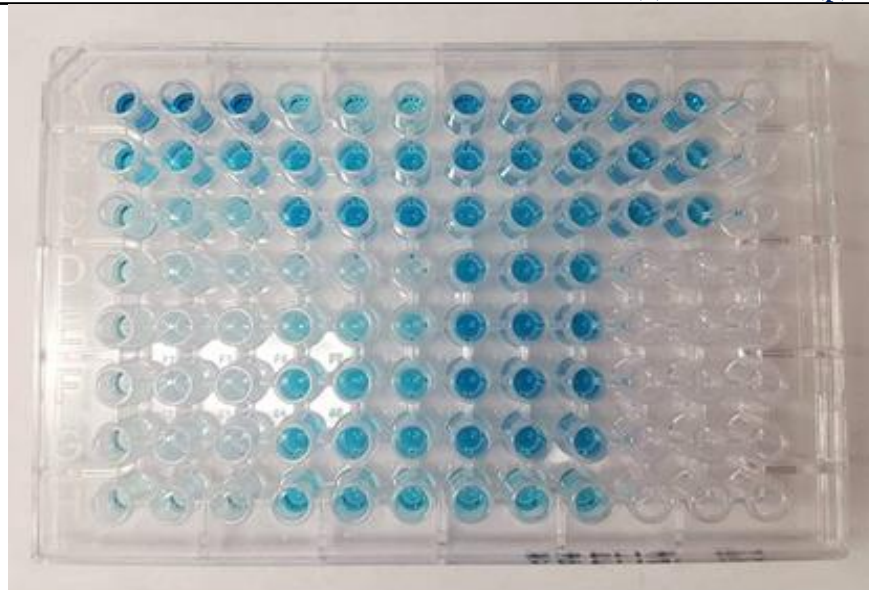


Figure B: ELISA kit used in screening



Figure C: Kit for RPR test

Statistical Analysis

All the data were input into IBM SPSS Statistics (version 27). Means, standard deviations, frequencies and percentages were used to summarize donor details and the rate of infection. T

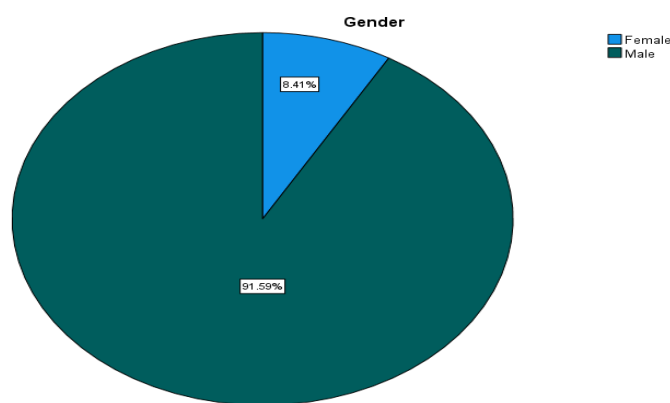
RESULTS: Analysis of data collected to undertake this study was undertaken using IBM SPSS Statistics version 26.0 (Statistical Package for the Social Sciences). It made use of descriptive statistics to summaries the variables and gave results.

Contribution of blood donors by sex:

Amongst the 226 voluntary blood donors, males dominated by overwhelmingly high numbers (207, or 91.6%), as opposed to just 19 females (8.4%) as shown in **Table 1**. This gender gap mirrors longstanding sociocultural codes in Pakistan sociocultural conditioning that blood donation is one of the male virtues.

Table 1: Contribution of blood donors by sex

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	19	8.4	8.4	8.4
	Male	207	91.6	91.6	100.0
	Total	226	100.0	100.0	

**Figure 2: Pie chart of Gender distribution**

Pie chart of gender distribution represents 91.59% male and 8.41% female participants in this study. The high percentage of male participants suggests that the study population is predominately male, which could

affect how broadly applicable the results are, particularly if gender-related factors are significant to the study's conclusions.

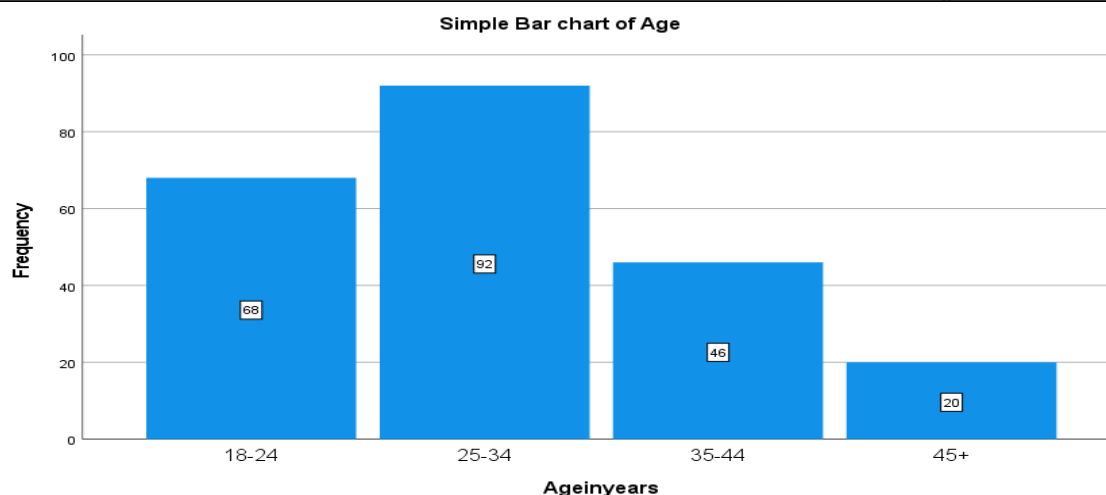
Age Distribution

Table 2: blood distribution according to Age group

Age in years		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-24	68	30.1	30.1	30.1
	25-34	92	40.7	40.7	70.8
	35-44	46	20.4	20.4	91.2
	45+	20	8.8	8.8	100.0
	Total	226	100.0	100.0	

In the above table (Table 2) age distribution of patients categorized into four groups, 18-24 years, 25-34 years, 35-44 years, over 45 years, with the frequency

of 68 patients, constituting 30.1% of the total, 92 patients, constituting 40.7% of the total, 46 patients, constituting 20.4% of the total, 20 patients, constituting 8.8% of the total respectively.

**Figure 3: Bar Chart of Age Distribution**

The bar chart (**Figure 3**) represents the age-wise distribution of the participants which can be seen that the 25-34 years age group has the highest number of respondents (92). It is followed by the teenagers and young adults group of 18-24 years who gave 68 respondents and the 35-44 years category who gave 46.

The 45+ age group were the least represented with just 20 participants. These results indicate that the research was conducted among a younger population where the number of respondents was substantially lower in older age groups. This age pattern can impact generalization of the study results into populations above this age range.

Table 3: Seroprevalence of HIV AND Syphilis in various cities in Pakistan

Study	city	year	HIV%	Syphilis%
Azeem, 2019	Norther Pakistan	2019	0.07%	0.16%
Red Crescent Lahore, 2020	Lahore	2020	0.03%	0.20%
Ghazanfer & Osman, 2021	Sialkot	2021	0.01%	0.65%
Ghazanfar et al., 2022	Sialkot	2022	0.00%	0.93%
Sabir et al., 2023	(AFIT, Rawalpindi)	2023	0.26%	0.90%
Ahmad et al., 2024	Faisalabad	2024	0.20%	1.30%
Shah et al. 2025	Hyderabad, Larkana	2025	3.22%	16.29%

The **Table 4** shows there were 226 blood donors being screened against transfusion-transmitted infections (TTIs). Out of them, 100 people (44.25%) were identified as being infected with at least one TTI. There was a specific number of the donors, 65 of them

(28.76) have syphilis, and 35 (15.48) have HIV. These results raise significant concerns regarding the high incidences of TTIs in blood donors, which are important to mitigate through stringent screening and prevention programmes in order to safeguard against risks to safety posed by blood transfusions.

Table 4: Seroprevalence of HIV AND Syphilis in asymptomatic blood donors

TTIs	No of positive subjects	Prevalence percentage (%)
People not diagnosed with any TTI	26	11.50%%
HIV	35	15.48%
Syphilis	65	28.76%
Total	226	55.66%

Discussion:

In the present study, prevalence of transfusion transmissible infections (TTIs), including HIV and syphilis, were studied among blood donors in Faisalabad, Pakistan, along with donor knowledge of blood donation practices, risk behaviour and the condition of participating blood donors. Nevertheless, the sample was predominantly male donors (91.6%) which agrees with the existing gender bias in blood donation that is a common phenomenon in many developing countries in which cultural and social factors play an important role in discouraging females from making blood donations (Bani and Giussani, 2010). Most donors were young adults, typically between 25 and 34 years, a pattern consistent with international findings where donations from younger people (who tend to be healthier and more available to donate) are higher (Zito et al., 2012). Over half of the participants were married and so marital status may have a part to play in donor risk profiles (Zucoloto et al., 2019), and the exploration of its impact on prevalence and risk behaviour needs to be explored further.

A majority of donor (83.2%) was voluntary non remunerated in this study which is a good sign of an established voluntary blood donation culture in Faisalabad. Replacement donors represented 14.2% of the sample and carried a greater risk of TTIs than did voluntary donors (89.8%). It appeared that the donation frequency was moderate overall, with nearly half of the donors giving blood at least once a year and about one third of donors twice per year. This pattern shows that donors are reasonably engaged but could benefit from being asked more often to donate which will increase blood supply stability and optimize donor screening efficiency in that repeat donors are low risk.

In general, donor knowledge regarding transfusion transmissible infections (TTIs) was high (91.2% knew about transfusion transmissible infections and 93.8%

concurred that donated blood should be screened prior to transfusion). The HIV was the most well-known infection related to blood transfusion risks while syphilis and hepatitis were followed. Detailed awareness regarding all major transfusion transmissible infections (TTIs) were, however, comparatively lower suggesting that there were gaps in more comprehensive awareness although awareness was, overall, high. The need for such enhanced educational programs is underscored by the partial nature of this knowledge of all relevant infections while promoting an integrated (holistic) view of transfusion safety.

The Donor's behavioral risk factors come at a high price to blood safety: 41.6% of donors said they engage in risky behaviour—more than one sexual partner and IV drug use or needle sharing. While fewer (4.9%) openly reported having multiple sexual partners, the large proportion (22.1%) choosing not to disclose it implies that there would be sensitivity in this topic or underreporting because of stigma or privacy concerns. In addition, there was a diagnosis of sexually transmitted infections in the past in 20.4% of participants, thus emphasizing the importance of strict donor screening and provision of counselling for identification and effective exclusion of the individuals at risk (Verweij and Kramer, 2018). More than 90% of donors reported receiving pre donation counselling and a medical history inquiry which indicates commendable compliance with procedural requirements among participating blood banks. Although the minority who were not asked about their medical history or did not receive counselling in the transfusions was an important gap that could affect transfusion safety if unaddressed. Overall, there was high transparency in screening processes, with many donors being explained by blood bank's screening processes and most of them believed the tests done on their blood. But such trust is essential to the blood supply system which must rely on

voluntary donations and retain the public's confidence in the blood supply (Gasparovic Babic et al., 2024).

The strengths of this study are the systematic sampling of donors from a range of major blood donation centers in Faisalabad ensuring that an adequate and representative volunteer donor population was sampled. By combining laboratory screening results with detailed structured questionnaires, it was possible to comprehensively evaluate the infection status of each patient including demographic and behavioral risk factors. Another benefit of the response rate and the depth of the information collected regarding counselling and medical questions related to blood donation adds to the validity of blood donation practices.

The study, however, has its limitations. By design, it is cross sectionally based, limiting inferences of causal relationships and changes in time trends in prevalence (Solem, 2015). Dependence on logs of self-reported sensitive behaviors, e.g. sexual practices and drug use, also brings the social desirability bias and underreporting risks and in turn their exposures to actual risk. Additionally, results are not generalizable to the entire population because most male donors which rule out most of the population that may have different risk profiles and donation behaviors. Finally, the study did not include advanced screening methods (such as nucleic acid testing) which could reduce the detection of early or window-period infections (Hans and Marwaha, 2014).

Conclusion:

The study finds that Faisalabad's voluntary blood donors are mostly young, male and well informed about transfusion transmitted infections (TTIs) like HIV and syphilis. They report good procedural compliance in following pre donation counselling and medical history screening as is the case with most donors who opt to donate (voluntary donation). There are still gaps in knowing the details of all TTIs, the disclosure of high-risk behaviors and uniform screening practices. To address these gaps, education must be improved, donors screened more robustly, recruitment efforts must be targeted towards underrepresented groups, especially. These findings suggest important measure that need to be exercised to improve transfusion safety in Pakistan

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