

## PREVALENCE AND RISK ASSESSMENT OF TRANSFUSION-TRANSMISSIBLE INFECTIONS AMONG BLOOD DONORS IN PAKISTAN

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### Abstract

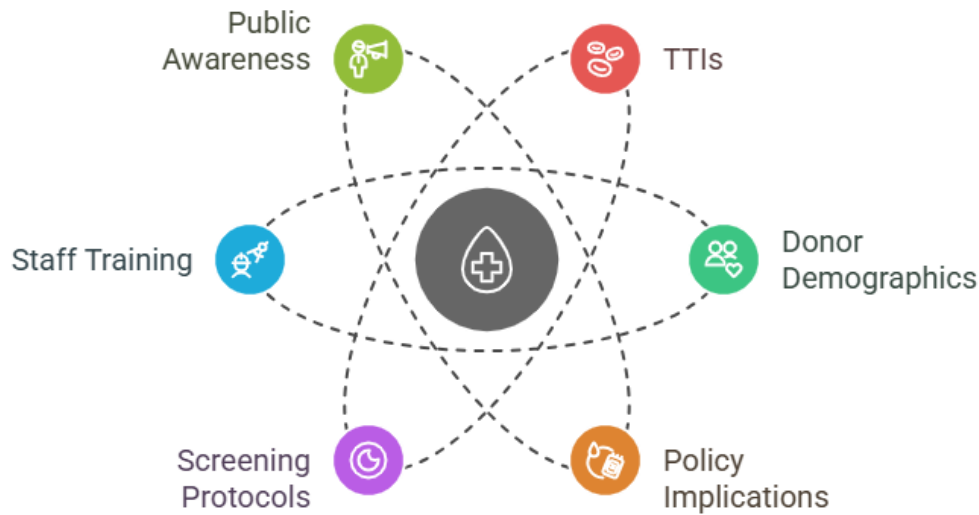
Transfusion of blood and blood components has become a norm in the current medical practice especially when it comes to support during surgical operations or in handling of various medical emergencies or chronic diseases. But, the disadvantage is that it is accompanied with a potential to transmit infections diseases commonly referred to as Transfusion Transmissible Infections (TTIs). In Pakistan, TTIs including HBV, HCV, HIV and syphilis remain of special interest because of the irregular manner of donor screening, poor knowledge of the population and high prevalence of these diseases. This cross sectional study intended to assess the TTIs summary among the blood donors a selected areas in Pakistan throughout the period 2020 to 2023. Cross-sectional study was done on 25000 blood donors; this involved voluntary and replacement donors whereby all data was received from the years 2012-2014. All the collected samples were subjected to HBV, HCV, HIV, and syphilis serology using standard serological testing procedures that conform to national standards. With this, it was realized that 4.76% of the donors reacted positive to at least one TTI. In particular, the overall HBV prevalence was 1.62%, HCV 1.94%, HIV 0.61%, and syphilis 0.59% regarding the donors. It is worth to note that TTIs were reported more frequent among replacement donors than the voluntary donors which calls for shifts towards voluntary unpaid blood donations. These findings call for enhanced measures in the enhancement of blood safety in Pakistan. Some of the recommendations were rigorous screening and policies to be adopted and strictly followed, increase the voluntary blood donation, and to launch public awareness campaigns regarding the factors that are associated with the negative repercussion of transfusion of unsafe blood. These interventions will greatly help to decrease the burden of TTIs and ensure safety in the supply of blood in Pakistan.

## 1. INTRODUCTION

Blood transfusion service is crucial in the treatment process of various treatments that cut across all areas of clinical practice, including urgency operations, planned surgical procedures, consistent essential practice in managing chronic and genetic disorders like thalassemia, hemophilia, cancer, etc. Being a necessary clinical product, blood and its components should be transfused in the right time and in a safe manner in order to prevent loss of life. However, this procedure of saving many people's lives also exposes the recipients to what is known as transfusion transmissible infections (TTIs) which are infections transferred from the donor to the recipient through the use of contaminated blood or blood products. TTIs are a significant issue in the international community, even more so in LMICs, including Pakistan; thus, health systems' essential characteristics, regulatory compliance, and the approaches to donor screening and evaluation may significantly differ (Ali et al., 2020). TTIs mainly consist of Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Human Immunodeficiency Virus (HIV) as well as *Treponema pallidum* bacteria – the cause of Syphilis. These infections are not only deadly, but also bring a very high load not only for the national health care systems but also for the patients themselves since the treatment of such conditions requires long-term care. These four infections should be screened from all blood donations in accordance to the World Health Organization specifications by using standardized and high sensitivity tests. Despite the mentioned guidelines, several blood banks in Pakistan, particularly those serving inadequately supplied regions, may be unable to practice these recommendations regularly, thus elevating the danger of unsafe transfusion. In Pakistan; the total blood donations per year is over 3 million; therefore, threat of TTIs still continues to be a problem. However, the growth of NBTS and bed development of screening policies are partially implemented and followed in both public and private sector blood banks (Khan et al., 2021). Lack of optimum laboratory facilities Chemists, inadequate staff training, inadequate supervision, and chemicals and reagents might be inconsistent and below par. This is magnified by Socio-cultural and logistic challenges that affect the encouragement of voluntary blood donation. Hence, all the same, there is a significant reliance in the present day markets on replacement donors who are associated with patients such as spouses and other close relatives, a category which has been widely known to have a higher incidence of TTIs compared to VNRs. Some research works based on samples from Pakistan have showed an inconsistency in the TTI appreciability and the difference due to place, domestic or urban, voluntary or replacement donor (Zulfiqar et al., 2019). For instance, the developed areas may have better detection centers, and enhanced health education, hence; low rates of infections. On the other hand, rural areas may have more patients due to increased population, transport difficult, inadequate trained personnel, and poor and inadequate diagnostic facilities which make prevalence rates higher. However, sociocultural prejudice, abasement of awareness among the public, and misconceptions regarding blood donation also have restricted the creation of a voluntary blood donation culture in Pakistan (Farooq et al., 2022). One cannot overemphasize the significance of the best epidemiological data representative of the nation, which is so vast and multicultural as Pakistan. Accurate information assist in targeting vulnerable group, resources distribution, and improving public health interventions. This is even more so when it comes to TTIs and when one out of every 500 to one thousand unscreened or even not sufficiently screened blood units puts the patients' lives at risk. Therefore, the aim of this research was to assess the overall proportion of the key TTIs; HBV, HCV, HIV, and syphilis among the blood donors in the targeted areas in Pakistan. It also aims at comparing TTI positivity with given donor characteristics as age, gender, and type of donation. This paper has sought to compare infection rates among the voluntary and replacement donors with the hope of making a contribution with regard to policy and practical implications as well as recruitment and quality assurance of blood transfusion services. Lastly, the

outcomes shall be used to appeal for increased compliance with screening guidelines, improved staff education in blood banks, and increased enlightenments to the general public, hence reducing transfusion risk across the country.

### Enhancing Blood Safety in Pakistan



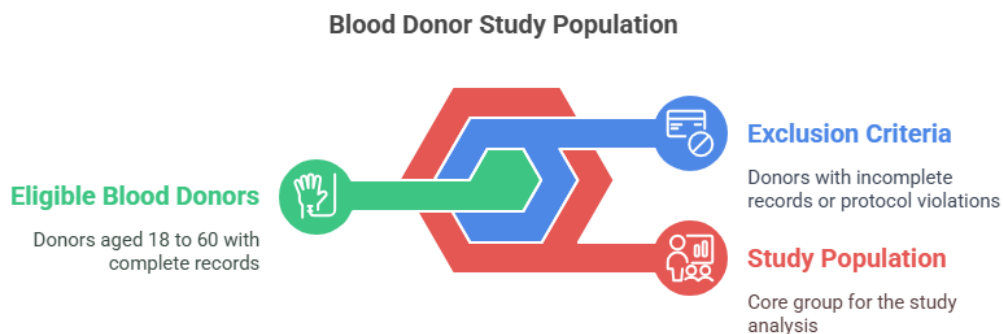
## 2. METHODOLOGY

### 2.1 Study Design and Setting

This cross sectional study was done at five big tertiary care hospitals and their attached blood banks located in five different provinces of Pakistan including Punjab (Lahore, Rawalpindi), Sindh (Karachi), Khyber Pakhtunkhwa (Peshawar) and Baluchistan (Quetta). Data was obtained based on the analysis of the subsequent months, years and consequently the time interval for the analysis is from January 2020 to December 2023.

### 2.2 Study Population

The study population included all blood donors aged 18 to 60 years who donated blood during the specified period. Exclusion criteria included donors with incomplete records or those who had donated blood outside the standard donor screening protocol.



### 2.3 Sample Size and Sampling Technique

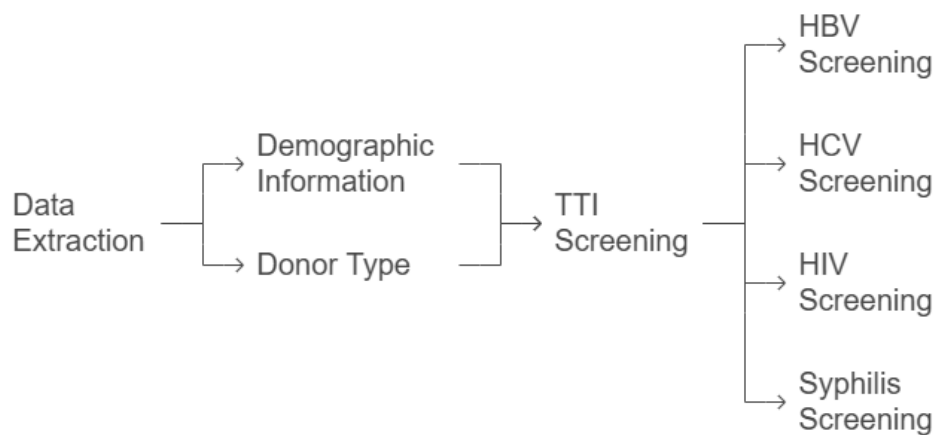
A total of 25,000 blood donor records were randomly selected using a stratified random sampling method to ensure regional representation. The sample included both voluntary and replacement donors.

### 2.4 Data Collection

Data on age, gender, donor type (voluntary/replacement), and TTI screening results were extracted from donor registries and laboratory screening logs. TTIs screened included:

- **HBV** (HBsAg via ELISA)
- **HCV** (Anti-HCV antibodies via ELISA)
- **HIV** (HIV I & II via ELISA)
- **Syphilis** (Rapid Plasma Reagin - RPR and TPHA confirmatory test)

### Blood Donor Screening Process



### 2.5 Data Analysis

Data were analyzed using SPSS version 25. Descriptive statistics were used to calculate frequencies and percentages. Chi-square test was applied to evaluate associations between variables, with  $p < 0.05$  considered statistically significant.

## 3. RESULTS

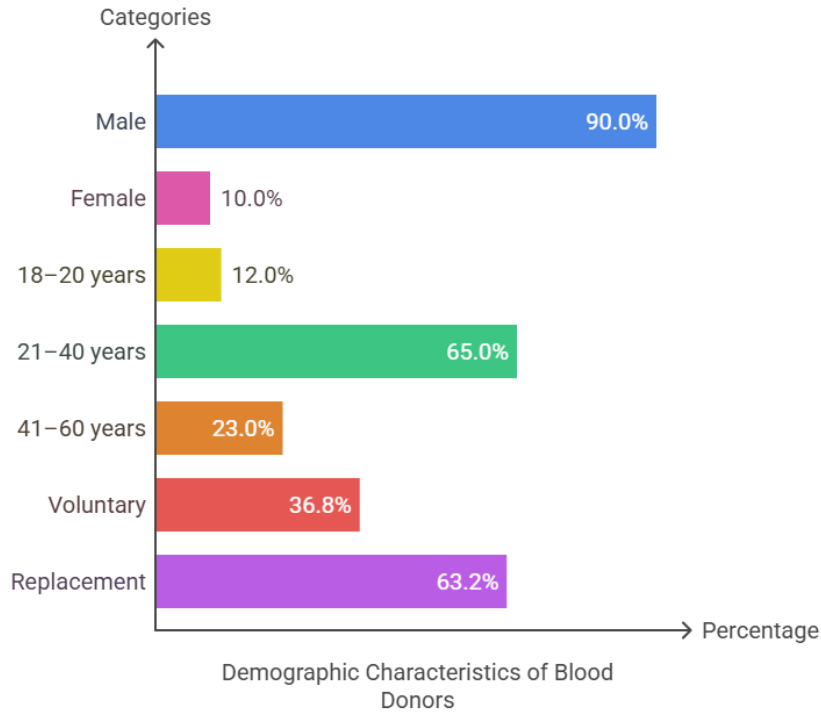
### 3.1 Donor Demographics

Out of 25,000 donors, 22,500 (90%) were male, and 2,500 (10%) were female. The majority (65%) were aged between 21 and 40 years. Table 1 summarizes donor demographics.

**Table 1:** Demographic Characteristics of Blood Donors (N=25,000)

| Variable    | Frequency | Percentage (%) |
|-------------|-----------|----------------|
| Gender      |           |                |
| Male        | 22,500    | 90.0           |
| Female      | 2,500     | 10.0           |
| Age Group   |           |                |
| 18–20 years | 3,000     | 12.0           |
| 21–40 years | 16,250    | 65.0           |

|             |        |      |
|-------------|--------|------|
| 41–60 years | 5,750  | 23.0 |
| Donor Type  |        |      |
| Voluntary   | 9,200  | 36.8 |
| Replacement | 15,800 | 63.2 |

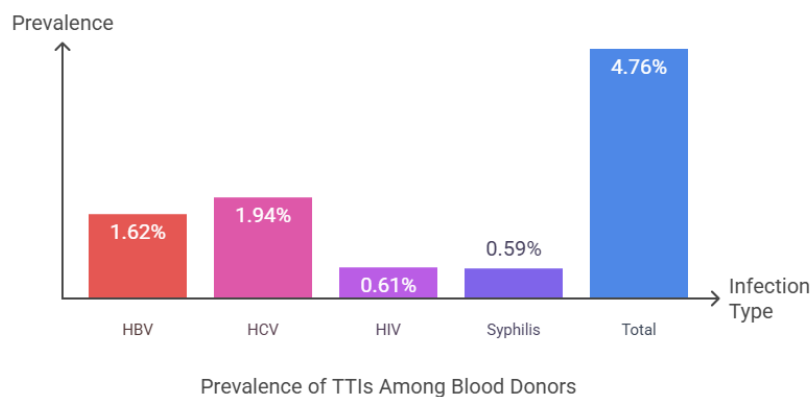


### 3.2 Overall Prevalence of TTIs

The overall TTI prevalence among donors was 4.76%. HCV was the most prevalent infection, followed by HBV, HIV, and syphilis.

**Table 2: Prevalence of TTIs among Blood Donors**

| 0        | Number of Positive Cases | Prevalence (%) |
|----------|--------------------------|----------------|
| HBV      | 405                      | 1.62           |
| HCV      | 485                      | 1.94           |
| HIV      | 152                      | 0.61           |
| Syphilis | 148                      | 0.59           |
| Total    | <b>1,190</b>             | <b>4.76</b>    |

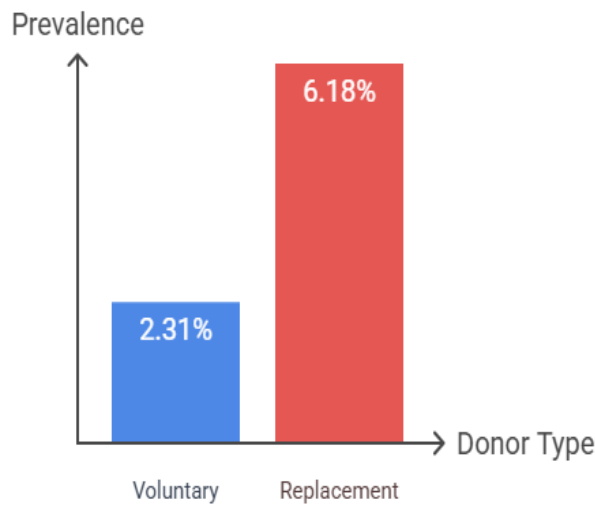


### 3.3 Prevalence by Donor Type

Replacement donors showed significantly higher TTI prevalence compared to voluntary donors ( $p < 0.01$ ).

**Table 3: TTI Prevalence by Donor Type**

| Donor Type  | Total Donors | TTI Positive | Prevalence (%) |
|-------------|--------------|--------------|----------------|
| Voluntary   | 9,200        | 213          | 2.31           |
| Replacement | 15,800       | 977          | 6.18           |



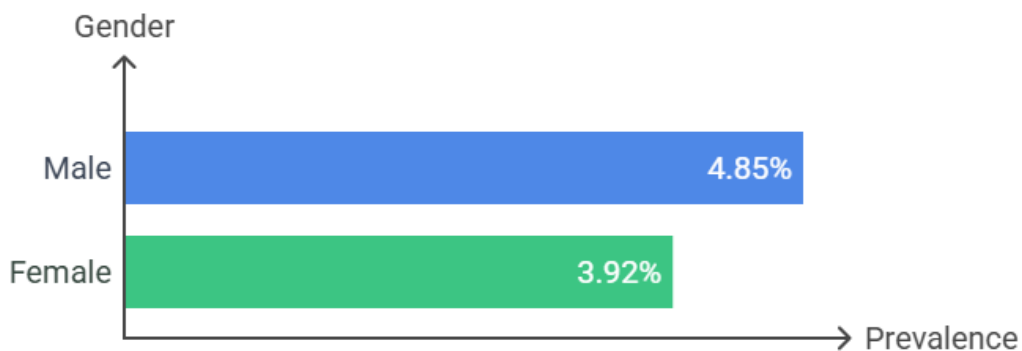
TTI Prevalence by Donor Type

### 3.4 Gender-Wise Prevalence

Males had a slightly higher TTI prevalence compared to females.

**Table 4: TTI Prevalence by Gender**

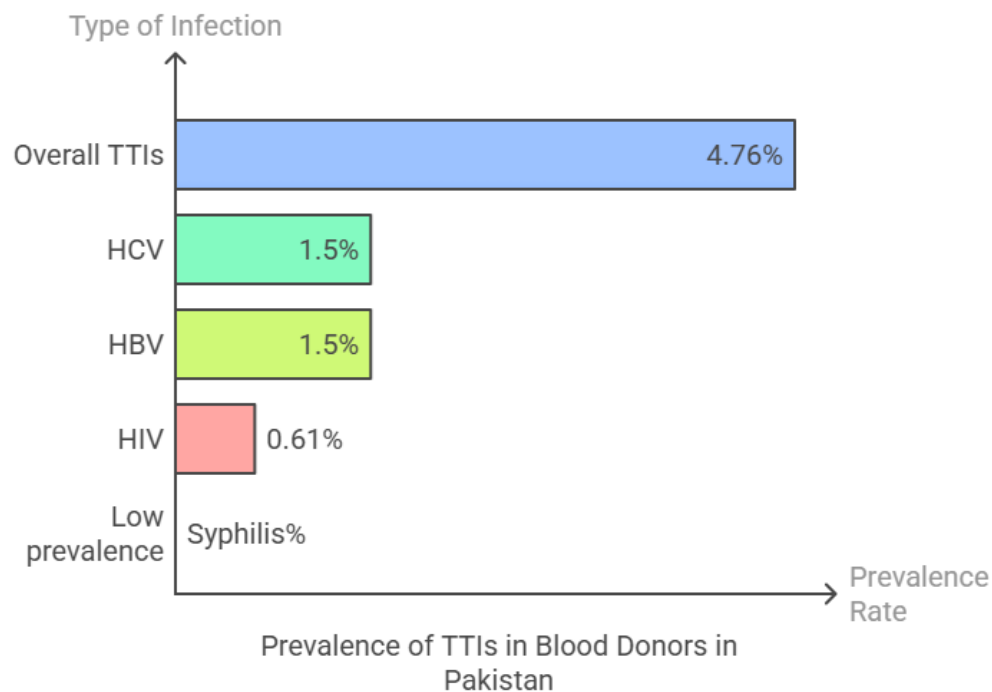
| Gender | Total Donors | TTI Positive | Prevalence (%) |
|--------|--------------|--------------|----------------|
| Male   | 22,500       | 1,092        | 4.85           |
| Female | 2,500        | 98           | 3.92           |



TTI Prevalence by Gender

#### 4. DISCUSSION

Subsequently, the current study also inclined towards revealing that TTIs persist a significant threat to blood transfusion safety in Pakistan. The overall prevalence of 4.76% obtained falls within the range of between 3% to 6% that is evident from the prior studies done in different regions of the country (Ahmed and Baig, 2018; Rehman et al., 2020). The prevalence of HCV and HBV among donors indicates the epidemic rates of those diseases in Pakistan (WHO, 2021). A few of the revelations that have been made includes higher prevalence among replacement donors as opposed to voluntary ones. This has been seen in other settings of low resources in which family or paid donors may be more likely to patronize risky behavior (Waheed et al., 2019). It is thus crucial to promote voluntary, non-scheduled, and low-risk blood donation (Mujeeb et al., 2021). This is in line with National HIV prevalence in Uganda with 0.61% among the donors but a massively dangerous anderen when it comes to HIV transmission through blood transfusion NACP 2022. Due to the increasing trend of the re-emergence of Syphilis, it is also another disease that needs attention even though the percentage is comparatively less. However, it is essential to focus on specific gender ratio that there are more male donors than female donors present in the said structure – this ought to be an important focus of attention. There is still poor patient donation from women, perhaps because of cultural differences, and social and physiological barriers as noted in previous literature (Akhtar et al., 2017). Therefore, there is a need to diversify the donor pool through the consideration of other procedures to recruit the donors. These findings underscore the need for better practices on screening processes, renovation of laboratories, quality assurance and provision of a central body overseeing the blood transfusion services in the country.



#### 5. CONCLUSION

This research establishes the extent of a great concern to the general health of the donors in Pakistan by finding out that TTIs including HCV and HBV are the most frequently detected infections. The findings show a higher prevalence of TTIs among replacement donors the call for a change of risky behaviors in blood donation. These findings underline the

need to improve the national blood transfusion services in different spheres at once. The first policy recommendation would therefore be that there is a continuous call for voluntary non-remunerated blood donation since it is safer. Second, to ensure the cases of TTIs are well detected there should be compulsory strict adherence to the set donor screening policies in all the public and private blood banks. Last but not the least, there is need to perform advocacy on matters touching on unsafe transfusion and frequent voluntary donations. These stronger foundations will help enhance effective transfusion practices and enhance the safeguard of parties involved in blood transfusion in Pakistan's health care sector.

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