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Prevalence of Transfusion-Transmissible Infections (TTI's) in Blood Donors in District Faisalabad

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Abstract
Objective: The evaluation of current prevalence rate Transfusion-Transmissible Infections (TTIs) in blood donors in district Faisalabad, Pakistan.
Study Design: Descriptive method is the design of study
Place of the Study: Department of AHP, GCUF.
Duration of the Study: January 2024 - May 2024
Material and method: Blood donors who qualified for blood donation criteria were screened for Hepatitis B, Hepatitis C Syphilis and HIV and Malaria antigen-antibody combination by ICT or chemical luminescent Immunoassay by Mindray CL-900i. All reactive TTI donors were informed and guided to consult with the medical physicians. Descriptive statistics including significance of association were evaluated.
Results: The prevalence of these five (Hepatitis B, Hepatitis C, Syphilis, HIV and Malaria) among blood donors was estimated to be 3.58% out of 5000 sample/donors. Hepatitis B (0.7%), Hepatitis C (1.3%), Syphilis (1.3%), HIV (0.2%) and Malaria (0.1%) respectively.

Keywords: Prevalence, HIV, Syphilis, Hepatitis B, Hepatitis C, Malaria, Transfusion-transmissible infections, Congenital, Human immunodeficiency virus, Treponema pallidum, CL-900i, Healgen, Immunochromatography, ELISA.

Introduction

Worldwide, Blood transfusion plays a crucial role in healthcare medicine, saving millions of lives all over the world[1]. According to WHO, 118.5 million blood donations occurred worldwide in June 2023 and 58% of those crop up in low and middle income countries[2]. Although blood donation can enhance patients' quality of life, but compromised blood transfusions can lead to Blood mediated infections resulting in various life-threatening complications[1]. Donor selection criteria should be implemented at national level to reduce the risk of transmission of Transmissible-Transmitted Infections[3]. Most common TTIs are HBV, HCV, HIV, Treponema Pallidum (Syphilis) and Malarial parasite[4]. According to WHO, in 2006 there were only 36 countries which acquired blood from their familial relation in 75% of cases[5].

Although Pakistan has a high prevalence of HBV and HCV, recent studies have raised concerns about a rise in other TTIs, such as HIV and syphilis. Understanding their risk factors is crucial in Pakistan[6]. Major identified risk factors for HCV in Pakistan are HCV infected mother, hospitalization, male sex and dental treatment. However in case of HBV the risk factors include HBV infected mother and circumcision by Barbour[7]. Risk factors of other sexually transmitted disease like HIV and Syphilis correlate with each other despite there difference in vectors and mode of transmission like unprotected sex, using alcohol that will influence sexual behavior negatively, unsafe blood transfusions and accidental needle stick injuries[8]. Malaria is endemic in Pakistan which spread seasonally so its risk factors mainly depend upon climate such as heavy rainfall and warm temperature that promote parasite sporogony[9].

The primary aim of this study is to determine the prevalence of these five TTIs in blood donors to check the presence of these TTIs in healthy donors of different ages and genders in public and private sectors of Faisalabad. To rule out asymptomatic patients from healthy and fit donors is another goal by making it possible to eliminate risk factors for TTIs among healthy donors[2]. So, it is vital to determine the prevalence and incidence of TTIs to highlight the need to control the spread of the disease and prevent the occurrence of the disease in the population. The actual prevalence in our population is still not known due to lack of screening, limited health services and lack of information[10].

Materials and Methods

The data for this descriptive retrospective study shows the record of patients Jan 2024- May 2024. The data was collected from Ghulam Muhammad Abad (GMA) teaching Hospital Faisalabad, Saman Abad Government Hospital Faisalabad, Allied Hospital Faisalabad and National Hospital Faisalabad after clearance. The study was approved by the Department of Allied health professionals, GCUF.

The data collected includes Age, Weight, Gender, Hemoglobin Level, Blood Pressure and medical history of the patients. The inclusion criteria for age ≥18 years, body weight is ≥55 Kg, good vital signs and hemoglobin level is ≥12 gm/dL. All donors were interrogated for any type previous sickness and donation history prior to blood collection. Donors who were having any history HCV, HBV HIV, Syphilis, Malaria, jaundice, anemic donors, having intravenous (IV) drug abuse, non-marital sexual contacts, tattooing and recent blood transfusion or recent surgery, having pregnancy in case of females or apparently unhealthy, were excluded from this study.

Methodology

5000 blood donors, most of them were male (4965), visited the blood bank and were screened for TTI causing agents according to the SOPs. Potential blood donors had to fill a medical history questionnaire and donor consent form prior to screening.

Table1. Gender wise distribution of samples.

GENDER

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	35	.7	.7	.7
	Male	4965	99.3	99.3	100.0
	Total	5000	100.0	100.0	

In the GMA hospital, Saman Abad general Hospital and Allied Hospital Faisalabad the screening for donor samples was carried out by ICT-technique. The apparatus used for HIV was Healgen HIV 1/2 having a specificity >99% and sensitivity >99%. For HBV, HCV, Malaria and Syphilis, Healgen Screening Kit was used having a specificity 100% and sensitivity 99.54%. Screening in the National Hospital was done by ELISA technique by CL-900i Chemiluminescence Immunoassay Analyzer by Mindray. The apparatus used has the sensitivity 90.1% and specificity of 95.3%. Controls were run simultaneously. Out of 5000 samples, 932 (18.64%) samples were collected by ELISA method and remaining 4068 (81.36%) samples were collected by ICT method.

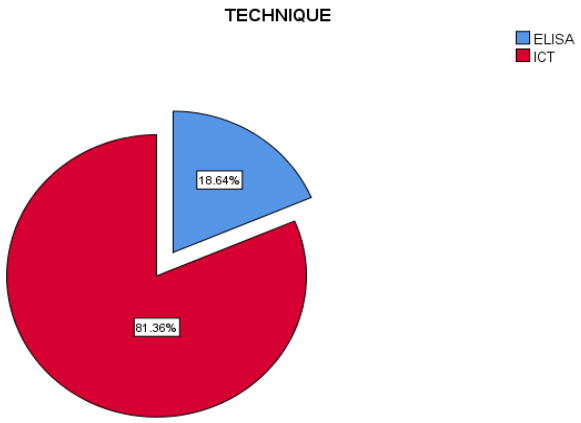


Fig. 1: Percentage of tests by two different techniques; ICT and ELISA.

RESULTS

Out of 5000 donors, 4965 were male (M) donors and 35 were female (F) donors. 4068 donor samples were screened for TTIs by ICT technique including 34 female donors. ELISA technique was performed on remaining 932 samples including one female donor.

179 positive cases were found from 5000 donors out of which 134 cases (M=133, F=1) were diagnosed through ICT method and 45 cases (M=45, F=0) were diagnosed through ELISA method.

Table 2. Obtained results from blood donors.

RESULTS FROM BLOOD DONORS

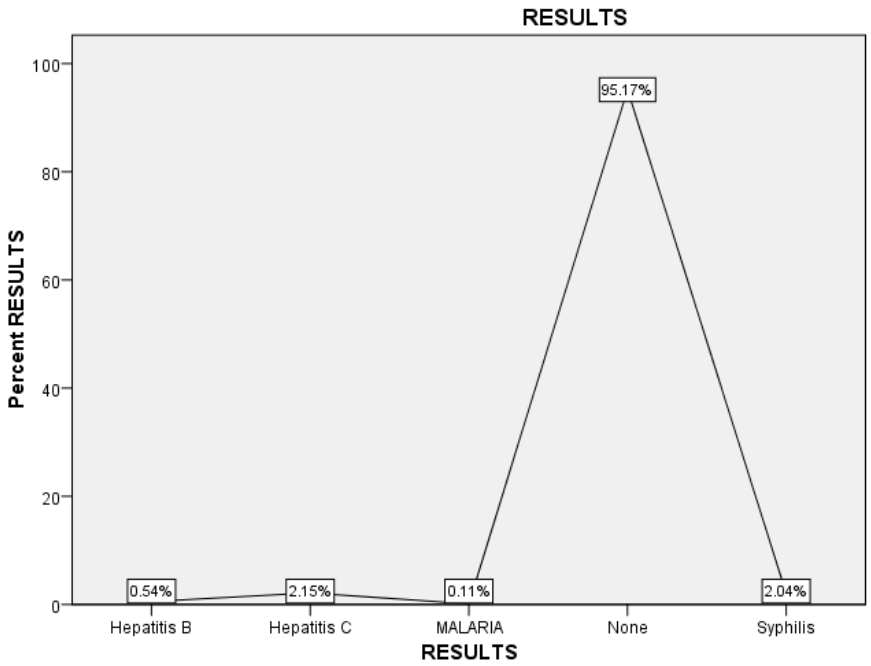
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hepatitis B	34	.7	.7	.7
	Hepatitis C	65	1.3	1.3	2.0
	HIV	10	.2	.2	2.2
	MALARIA	5	.1	.1	2.3
	None	4821	96.4	96.4	98.7
	Syphilis	65	1.3	1.3	100.0
	Total	5000	100.0	100.0	

By ELISA method it is shown that prevalence of hepatitis C is more prevalent 2.1% (n=20) followed by Syphilis 2.0% (n=19), Hepatitis B 0.5% (n=5), Malaria 0.1% (n=1) and HIV 0% (n=0).

Table 3: Gender wise distribution from ELISA

		Frequency	Percent
Valid	Female	1	.1
	Male	931	99.9
	Total	932	100.0

Fig. 2: Percentage of Results by ELISA method.

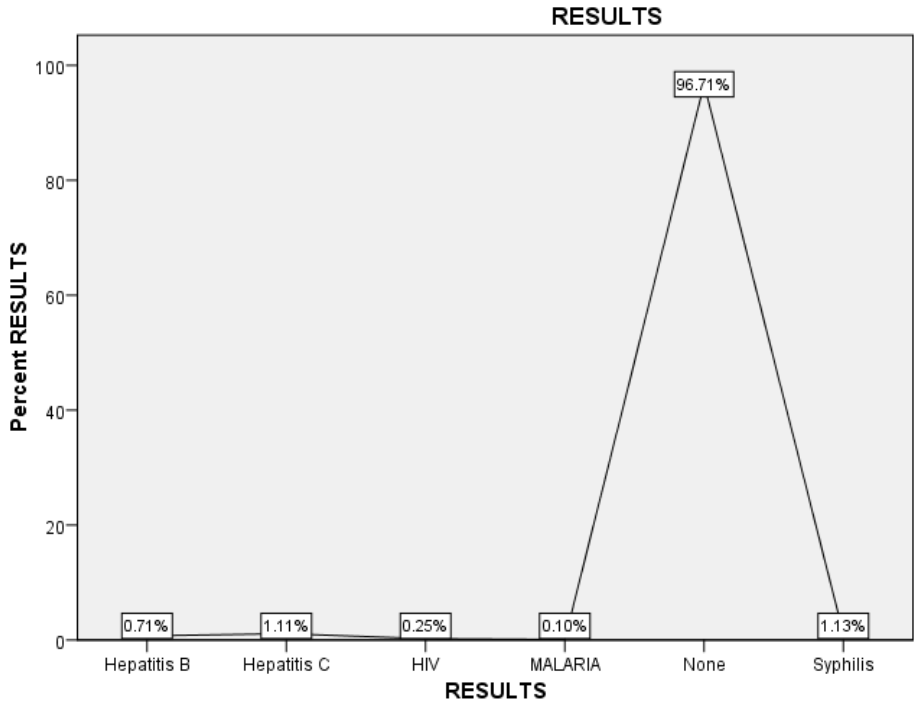


By ICT method it is shown that prevalence of Syphilis is more prevalent 1.1% (n=46) followed by Hepatitis C 1.1% (n=45), Hepatitis B 0.7% (n=29), HIV 0.2% (n=10) and Malaria 0.1% (n=4).

Table 4: Gender wise distribution from ICT.

		Frequency	Percent
Valid	Female	34	.8
	Male	4034	99.2
	Total	4068	100.0

Fig. 3: Percentage of Results by ICT method.



Discussion

Transfusion transmissible infections are mainly caused through blood transfusion[11]. Globally, the safe transfusion of blood is a challenge for healthier bodies due to its consequences[12]. Comparative analytical studies show the increasing trends of TTIs among the population[13]. Pathogens that can be transmitted through transfusion include the viruses Hepatitis B, C, D, and G, HIV, CMV, human T lymphotropic virus (HTLV I and II), as well as Treponema pallidum, Brucella species, Toxoplasma gondii, Plasmodium species, and Trypanosoma cruzi[6]. However blood screening of donors prior to donation reduced the chances of TTIs[14].

According to our study, 1.33% of positive syphilis cases (n=19 by ELISA and n=46 by ICT) as well as HCV cases (n=20 by ELISA and n=45 by ICT) are consistent with the increasing trend in Faisalabad followed by HBV, HIV and Malaria which is 0.7%, 0.2% and 0.1% respectively. The dominating part of the donors were male (more than 99%). In men Blood volume is high and iron stores are adequate it improves their ability to donate blood. Contrary to this, women are often excluded from blood donation due to physical problems like pregnancy, lactation and pathological causes like anemia. Most of the blood donations are from young people[15].

In 2020 researchers have done the systematic review and showed the frequency of HCV 2.44%, in 17660 blood donors, conducted in all over Pakistan in 26 studies. The prevalence of HCV varies in different studies as <2% in 8 studies and >4% in 3 studies[16]. Yet our research shows the prevalence of HCV 1.3%. The cumulative frequency for HBV is 2.04% in same 17660 donors. Every year about a million of people die due to chronic liver disease linked to HBV. 15 to 40 percent of those

develop cirrhosis and hepatocellular carcinoma (complication of HBV). A carrier person of HBV can spread without being noticed[17, 18].

The cumulative frequency of syphilis is 1.1% identified by the researchers through 6974 blood donors in 2020 in which 7 studies reported <1% and 4 studies reported >2% syphilis prevalence[16]. Each year about a million of pregnant ladies will give birth with active syphilis, (25% will give birth to stillborn children and 33% will give birth to babies that are underweight if the treatment is not carried out). However if single dose of penicillin is given to those before 28 weeks gestation, the outcomes of syphilis can be avoided[19]. Malaria is one of the most infectious diseases to infect humans. Female anopheles mosquito act as a vector that transmit the plasmodium specie into vertebrae host[20]. Previously a review article recorded 0.11% malarial frequency out of 368 donors, also all researches show less than 1% frequency (including our research 0.1%) except one research that is done by Ehsan *et al.,*[16].

A study conducted by Agha Khan University found that the prevalence of HIV associated with blood transfusions ranged from 0.013% to 0.116%[21]. Research indicates that the average incubation period and the time to develop detectable antibody levels for HIV is approximately eight weeks. Because antibodies are unlikely to be detected during this period, the risk of HIV transmission through blood transfusions is higher. The time between the onset of the infection and the appearance of viremia can extend up to five years[2].

In the current study, we established that the overall prevalence of TTIs in blood donors is 3.58%. Earlier studies from Faisalabad indicate 6.55%[22] and 10.5%[2] seroprevalence while collecting data from different hospitals through different techniques. When compared globally, studies from Nigeria (14.96%)[23], Sudan (20.1%)[24], Ethiopia (11.5%)[25] and Albania (7.4%)[26] show higher TTI prevalence while studies from Qatar (1.85%)[27], Eritrea (3.6%)[28] India (0.6%)[29] and Iran (0.25%)[30] show lower TTI prevalence.

In order to address this problem effectively, it is important to support the monitoring program. It will help in continuous improvement of donor selection criteria and its implementation for all blood donors. In addition, it is necessary to use more sensitive testing methods like NAAT or chemiluminescence assays. Adopting large-scale public awareness programs and education campaigns regarding Interventions in sexual health and risky behavior modification. Appropriate measures for public health should be taken frequently to ensure the elimination of these agents.

Conclusion

The found accumulative prevalence of five main TTIs; Hepatitis B, Hepatitis C, Syphilis, HIV and Malaria is 3.58% (approx. 3.6%). It is very important to ensure the provision of a standard diagnosis and treatment along with the immediate counseling of the sero-positive donors, specifically the youth of population, to control the spread of these potentially fatal agents in society.

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