Research Article

Trend of Infectious Disease Positivity in Exchange and Voluntary Blood Donors at Regional Blood Centre, Karachi

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Abstract: Background: Pakistan has a high prevalence of hepatitis and increasing prevalence of HIV, these infections imply a serious risk to the health of those who need blood transfusions. As blood donors are generally considered as the healthy population, assessing the risk of these silent killers in the blood donors can overall help in understanding the potential impact of these infections on the general population.

Objective: As the TTI prevalence is increasing rapidly in our region, it is much needed to take necessary actions for its prevention. The first step should be the actual frequency of these TTI's in healthy blood donors, so our study aimed to identify the positive ratio of Hep B, Hep C, HIV, malaria and syphilis in exchange and voluntary blood donors, their comparison and need of effective testing.

Materials and Methods: It is a retrospective analysis which was conducted from January 2020 to December 2020, in the Regional Blood Centre, Karachi. The data is taken from BBMIS software and analyzed by SPSS version 23. We included 56732 donors from January 2020 to October 2022. Screening of Hepatitis B, Hepatitis C and HIV was done by Chemoimmunoliscence (CLIA) whereas ICT based screening was done for Syphilis and Malaria.

Result: Among donors, 50147 (88.4%) were exchange while 6585 (11.6%) were voluntary donors. The frequency of HCV was 3.1% followed by HbsAg (2.3%) and syphilis (1.6%), HIV 0.3% and the least was malaria 0.2%. As 88% of the donors were exchange, TTI positivity was also more in them.

Conclusion: The prevalence of TTI in donors of RBC Karachi is worrysome. It highlights the fact of Nucleic Acid testing significance. Though CLIA is a sensitive technique, 100% safety of blood products requires the implication of Nucleic Acid testing, moreover the implication of voluntary blood donation should also be considered significantly.

Keywords: Transfusion transmitted infections, Exchange donors, Prevalence, Chemoimmunoliscence, Nucleic Acid testing, Voluntary donors.

INTRODUCTION

Hepatitis B and C virus are global health concern, with millions of people affected from by their infections, leading to serve health complications and fatalities. According to different survey's, approximately 2-3% [1] of the world's population is infected with hepatitis C, resulting in over 350,000 deaths annually to HCV related complications on a parallel note, the world wide prevalence of Hepatitis B Virus (HBV) infection stand at about 3.6 % encompassing over 360 million chronic carriers and contributing to approximately 620,000 deaths each year [2,3]. Hepatitis C Virus (HCV) was first identified in 1989 and has since become a significant global health concern, affecting approximately 58 million people worldwide. Most individuals with acute HCV infection fail to clear the virus and progress to chronic infection, leading to serious complications such as cirrhosis, portal hypertension, liver decompensation, and hepatocellular carcinoma. In Pakistan, the prevalence of HBV [4] and HCV [5] is reported to be 2.5% and 4.9% respectively. Both of these viruses can be transmitted through infected blood products, contaminated syringes, needles, razors, dental procedures, tattoos as well as vertical transmission [6].

HIV is a global health issue for the past 40 years, is a complex retrovirus with two main types (HIV-1 and HIV-2). It infects CD4+ immune cells, leading to immunosuppression, and can progress to acquired immunodeficiency syndrome (AIDS) [7]. The virus spreads through various means, including injectable drugs, unsafe blood transfusions, and sexual contact. In Pakistan, first case was diagnosed in 1988 and since than the risk of HIV is increasing day by day. According to 2021 statistics, the prevalence of HIV in Pakistan is 0.21%, however the actual number is still not known due to lack of testing. Due to use of infected syringes and transfusion of unsafe blood in 2019, WHO declared the outbreak of HIV in Sindh [8].

Syphilis is another transfusion transmitted infection, caused by bacterium Treponema pallidum (TP). It is a significant public health challenge worldwide, with an estimated seven million new cases reported each year, as noted by the world health organization (WHO) in 2020 [9]. Syphillis is initially transmitted through sexual contact but can also transmitted vertically from

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mother to child, and crucially through the blood and their components from an infected donor. (TP) is sensitive to cold temperature, therefore if the blood is stored below 20 degree for 72 hours or more, the chance of transmission potentially decreases [10]. In Pakistan, the prevalence varies from study to study, ranging from 1.3% to around 29% [11]. Previously, the blood donors reactive for Syphilis were deferred permanently, however, due to recent AABB guidelines and associated evidence, it has been included in temporary deferral now.

Malaria is a protozoan parasitic infection of humans resulting from one or more of the 5 species of the genus Plasmodium, Malaria is endemic in many regions of the world including Pakistan and can be transmitted through blood transfusion [12]. Malaria is still the key cause of morbidity and mortality worldwide especially in children under 5 years of age as well as pregnant women [13]. It can also cause missed abortions, miscarriages and if left untreated, can cause cerebral malaria. Therefore, the significance of Malarial testing is well established and mandatory in screening of blood components.

It is extremely difficult to screen whole population for these infections, and blood donors are usually the healthier people in a population, so by testing these blood donors we can assess the burden of these diseases as well as get them registered in the national data base. Our study, thus aimed to know the frequency of these 5 TTI's and their any significant association.

MATERIALS AND METHODS

The retrospective study was conducted at the Regional Blood Center Karachi (RBC-KHI), managed by the Fatimid Foundation, from January 2020 to December 2022. Ethical approval was obtained under reference number FF/ERC/2023/3. A total of 56732 donations were received from the year 2020 to 2022. Out of total, 4691 were excluded due to the reason of reactive viral history and/or missing data and 52568 were included in the study. There were 52549 males and 18 females. Blood donors were screened for HIV, HCV, HBV, Syphilis & MP. HIV, HCV & HBV were screened by using Roche analyzer Cobas e601 & e411 and the principle was Electrochemiluminiscence immunoassay (ECLIA). While Syphilis and MP were performed on the immunochromatographic test (ICT).

Selection and exclusion of blood donors was based on the American Association for Blood Banking (AABB) guidelines in the RBC-KHI, which including the details of blood donor with health history questionnaire e.g: name, age, gender, marital status, profession, address, and contact numbers, current or previous medical illnesses, histories of immunization, dental extraction, surgeries, previous blood transfusions and donations, places traveled, the risk of TTI, previous TTI related results and notifications, and a basic medical assessment report e.g: physical examination (e.g: Blood Pressure, HB & weight of the blood donor).

STATISTICAL ANALYSIS

The data was analyzed by using statistical package for social sciences (SPSS) version 23. Descriptive statistics was applied and frequency and percentages were reported for categorical variables. Chi square test was applied to observe the association between TTIs and gender and also between TTIs and donor type. P-value of <0.05 was considered statistically significant.

RESULT

A total of 56732 blood donors were recruited and screened in RBC-KHI. Almost all were men 56714 (99.97%) while the women numbered 18 (0.03%). Among donors, 50147 (88.4%) were exchange while 6585 (11.6%) were voluntary donors (Table **1**).

Table 1. Demographic Characteristics of Blood Donors.

Total Donors Recruited	**56732**	
Gender	**No. of Donors**	**Percentage**
Male	56714	99.97%
Female	18	0.03%
Donor Type		
Voluntary	6585	11.60%
Exchange	50147	88.40%
Frequency of Transfusion Transmissible Infections (TTIs)		
HBsAg	1280/56700	2.30%
HCV	1762/56714	3.10%
HIV	151/56703	0.30%
Syphilis	930/56724	1.60%
MP	103/56721	0.20%
Frequency of Donor's Blood Groups, n=52558		
A positive	12237	23.30%
A negative	999	1.90%
B positive	15887	30.20%
B negative	1205	2.30%
O positive	16464	31.30%
O negative	1197	2.30%
AB positive	4254	8.10%
AB negative	315	0.60%

The frequency of HCV was 3.1% followed by HbsAg (2.3%) and syphilis (1.6%). Frequency of transfusion transmissible infections (TTI) in donors visited and screened at different sites with maximum screening at Hospital Based blood bank of Dr. Ruth KM Pfau Civil Hospital followed by Hospital based blood bank of - Sindh Government Qatar Hospital. Exchange donors had higher frequency of TTI as compared to voluntary donors with no significant association among TTI and donor type to

find the correlation between TTI and donor types (voluntary & exchange), we found the p-value 0.197, 0.162, 0.708, 0.300 & 0.530 for HBsAG, HCV, HIV, Syphilis & MP respectively, the results found statistically in-significance between the TTI & donors type (Table **2**).

Table 2. Gender Association among Reactivity.

TTIs		Male	Female	P-Value
HbsAg	1280	1280	0	0.519
HCV	1762	1762	0	0.447
HIV	151	151	0	0.826
Syphilis	930	930	0	0.584
MP	103	103	0	0.856

To find the correlation between the TTI and gender, by using the Chi-square test, found the results for HBsAG, HCV, HIV, Syphilis & MP p-value 0.519, 0.447, 0.826, 0.584 & 0.856 respectively, which show no significance association between the TTI and gender (Table **3**).

Table 3. TTI among Voluntary and Exchange Donors.

TTIs	Interpretation	Voluntary	Exchanged	P-value
HbsAg	Reactive	134	1146	0.197
HCV	Reactive	186	1576	0.162
HIV	Reactive	19	132	0.708
Syphilis	Positive	118	812	0.300
MP	Positive	14	89	0.530

DISCUSSION

Transfusion transmitted infections have significant morbidity and mortality across the world. In Pakistan, the ratio is relatively higher all over due to significant usage of unsafe blood, infected needles and syringes, razors as well as lack of education for prevention [14]. Blood donors are relatively healthier people, who voluntarily or on exchange basis donate blood after thorough history and examination. Different studies have been conducted region wise, representing the prevalence of viral markers in healthy blood donors. In our study, Hepatitis C ratio was the highest in blood donors, (3.1%) which is in accordance with the majority of other studies. T. Butt *et al*. [15] reported the ratio to be 5.5% in Rawalpindi. It is slightly higher than our value due to the fact that population of Punjab has higher ratio of Hep C than population of Sindh. In the same study, Hepatitis B ratio was noted to be 3.45% whereas in our study, it was 2.3%. They did not include other TTI's in their study. S. Abdullah *et al*. [6] conducted a study in Lahore, determining the frequency of Hepatitis B virus in blood donors. They reported it to be 1.65% which was slightly lesser than our study. One factor could be the difference in technique as we used Chemoimmunoliscence and they conducted tests on rapid kits, the sensitivity and specificity of both techniques is different. U. Waheed *et al*. [16] published a study from Islamabad, reporting the ratio of Hepatitis C 8.34% and Hepatitis B to be 3.91%. These ratios are quite higher compared to our study, the two prominent reasons could be the smaller sample size and the greater frequency of Hepatitis B and Hepatitis C in Punjab. Coming towards Sindh, Irfan *et al*. [17] conducted a study in Liaquat National hospital Karachi, it showed the ratio of Hepatitis B to be 1.90%, Hepatitis C to be 2.61%. The ratio is slightly lower than our study attributed to the fact that the population going to private sector hospitals and those coming to government sector hospitals, are quite different. Moreover, we have many of the exchanged donors from interior of Sindh due to non-availability of some treatment facilities at their government sector hospitals. One more study was conducted at National Institute of blood disease by Aisha *et al*. [18] showing Hep B and Hep C frequency 1.84% and 1.7%. Both these are quite lower than other studies, due to lesser number of donors (around 16000) and relatively higher socioeconomic status. Sara *et al*. [19] conducted a study in 2018 at Nawabshah. The ratio of hepatitis B was shown to be 6.52% and hepatitis C was 5.83%. The large difference contrary to other studies of Karachi is considered due to the fact that population of interior Sindh has more ratio of TTI than Karachi. The ratio of HIV is also increasing in Pakistan, [20] however, in our study the frequency in healthy blood donors was calculated to be 0.3%. A meta-analysis was performed by Bushra *et al*. [21] which included 32 papers, frequency in blood donors was found to be 0.00111%. It is quite low as compared to our study, the reasons could be the difference in number of donors as well as the year of this analysis. It was done in 2015 and studies included were from 1988-2012 whereas in 2019, WHO declared the outbreak of HIV in Sindh and since than the numbers are increasing. Sara *et al*. [19] in their study presented the frequency of HIV to be 6.33% which is contrary to our as well as other studies. The ratio of HIV positivity in interior Sindh is increasing day by day and if definitely worrisome and requirement of Nucleic Acid testing is a necessity. Bilal *et al*. [22] conducted a study in Southern Punjab and reported 0.13% of blood donors to be HIV positive, however, the method used was ICT screening and donors included were only 1500. Mahwish *et al*. [23] conducted a study in Islamabad in 2022, that reported HIV to be 0.1% that is again lower than our study, as it is a latest study and included large number of donors, the difference is again rising the increase trend of HIV in Sindh as well as Karachi. It is a dangerous factor and we need to be more vigilant in our testing. Other studies including the private sector hospitals reported HIV to be 0.10 [17] and 0.07% [18] representing the difference in the socioeconomic status of the blood donors.

Syphilis in our study was the third most prevalent TTI with around 1.6% of blood donors. Sara *et al*. [19] in their study calculated the frequency of Syphilis to be 1.1% which is almost similar to our study. We also used the same method of screening for syphilis. In Southern Punjab [22], it was reported to be 0.46%, however, with the less number of blood donors. Mahwish *et al*. [23] reported Syphilis to be 0.8%, they used the ECLIA method for Syphilis screening which is more specific than the ICT method and has less chances of false positivity. It also

highlights the fact that performing Syphilis testing on ECLIA is better than the ICT method.

Lastly, Malaria parasite was checked through ICT method and confirmed by microscopy, and it reported to be 0.2%. Fortunately, malaria was reported least in our data due to the strong history of blood donors and confirmation through microscopy. The study conducted in Nawabshah [19] reported Malaria to be 1.24% may be due to lack of above-mentioned factors. The other studies of Islamabad and Karachi reported them to be 0.04% [23] and 0.07% [18] respectively.

All of the above studies, either conducted CLIA or ELISA testing for these viral markers or enhanced the impact of Nucleic Acid Testing (NAT) in blood donors [24, 25].

This study can help to assess the risk of TTI in normal healthy individuals and thus can aid the medical practitioners to evaluate the increasing risk of these infections in our population.

LIMITATIONS

Our study had few limitations including a smaller number of female donors, a smaller number of voluntary blood donors as well as lack of confirmatory testing on blood donors.

CONCLUSION

The rising trend of Hepatitis B, Hepatitis C and HIV is worrisome and signifies a definite need of Nucleic Acid testing in regional blood centers as the blood donors of government sector hospitals has increased risk of these TTI than those coming to private hospitals. Moreover, as it was evident that the majority of TTI were reported in exchanged blood donors, there is an urgent need to enhance the voluntary blood donation so more of the safe blood is provided to the patients.

AUTHORS' CONTRIBUTION

- **Samra Waheed**: Conception, Designing, Manuscript writing.
- **Muhammad Sarwar Khan**: Manuscript editing, Critical revision.
- **Shumaila Qamar**: Data analysis, Data interpretation.
- **Syeda Madiha Shah**: Data entry, Manuscript.
- **Erum Rafiq**: Design of study, Manuscript designing, Critical revision.

CONFLICT OF INTEREST

Declared none.

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