

A Study of Blood Donor Deferral Causes: Pre vs Post Donation and Transfusion Transmissible Infections

Farah Hanif¹
Sundas Ali²
Muhammad Bilal Habib³
Ayesha Siddiqa⁴
Muhammad Anees⁵

Abstract

Objectives: The aim of this study was to evaluate the prevalence of different causes of donor rejection before and after blood donation based on donor selection tools, and to see the usefulness of Chemiluminescence Immunoassay (CLIA) technique over rational screening by kit method in detecting borderline cases of TTI.

Methodology: All donors who came for the donation of blood over a period of 02 years between March 2019 to February 2021 were evaluated after taking their consent and seeking approval from Hospital Ethical Review Board. The data was analyzed to determine using SPSS version 20.

Results: Among 1849 individuals, mostly ranging between 25 to 45 years, presenting for blood donation, 164 (8.8%) were deferred. Among total deferred cases, 95(57.9%) were temporary deferrals and 69(42%) were permanent deferrals. The most frequent cause of deferral was low hemoglobin. Anemia was the leading cause of deferral in approximately one third of the rejected individuals (n = 51, 31%). One striking finding observed in this study was that 4.7% HCV positive and 62.5% HIV positive donors were in window period, which showed borderline results on CLIA.

Conclusion: Donor deferral, both pre and post blood donation is a major problem in our country and accounts for 8.8% of all prospective blood donors. Our results put an emphasis on addressing these causes efficiently to ensure safety of both the donor and potential recipients.

Keywords: Blood donors; Deferral; Anemia; Transfusion transmissible infections; Screening; Donor questionnaire.

¹Department Blood Transfusion Alkhidmat Raazi Hospital Rawalpindi,
^{2,4,5}Department of Pathology, Pakistan Institute of Medical Sciences (PIMS) Islamabad.
³National Institute of Health Islamabad Pakistan

Address for Correspondence

Dr. Sundas Ali
 Department of Pathology, Pakistan Institute of Medical Sciences (PIMS) Islamabad.
 sundasali243@gmail.com

Introduction

Blood donation consistently stays as an imperative life-saving activity in medication, particularly in patients having health related crisis.^{1,2} The requirement for blood is around the world. Notwithstanding, various patients who may require bonding don't have ideal access to safe blood, so there is a significant contrast between the creating and created nations in admittance to safe blood. Safe blood bonding is a worldwide worry that needs the utilization of numerous fields, including science and innovation for blood handling and testing, just as friendly endeavours to advance blood donation by adequate quantities of intentional and sound givers who are having okay of contaminations that can be sent to the blood recipients.³

In excess of 92 million blood donations are gathered every year from 164 unique nations all throughout the planet as Estimated by WHO Global Data base.⁴ Each Blood bonding conveys a danger of communicating blood-borne infections, including mostly human immunodeficiency infection (HIV), hepatitis C infection (HCV), hepatitis B infection (HBV), and syphilis. To improve these blood bonding security rehearses, the World Health Organization (WHO) suggests a consolidated methodology including the foundation of efficient blood donation center administrations, masterminding of blood donation from intentional random benefactors, screening of gave blood for in any event the four significant bonding contagious contaminations (TTI) with quality-guaranteed tests, reasonable utilization of blood and execution of employable quality control frameworks.^{4,5} Selection of blood benefactors with low TTI hazard followed by powerful lab screening is the significant piece of the cycle, as it has diminished the danger of transmission to exceptionally low levels over the most recent 20 years.^{6,7}

Authorship Contribution: ¹Conceived and planned the idea of the study, final approval of the version to be published, Collecting the data, ²drafting the work or revising it critically for important intellectual content: ^{3,4}Data Analysis, literature review.

Funding Source: none

Received: Sept 27, 2021

Conflict of Interest: none

Accepted: Feb 02, 2022

In nations like Pakistan, the critical apparatus for blood benefactor choice would be a "giver poll" that will pass judgment on a contributor's wellbeing and history that would assist with assessing if the benefactor has any danger for having a blood borne disease that could be sent and moreover has no reasonable suitable test. From that point onward, a private meeting ought to be led to guarantee that all inquiries are addressed effectively.^{3,4,5} Serologic testing by Rapid unit techniques for bonding sent sicknesses had truly been the establishment of blood screening, while more current methodologies like ELISA (Enzyme connected Immunosorbent Assay), CLIA (Chemiluminescence immunoassay) and nucleic corrosive testing (NAT) have promoted abbreviate the "window period" of infectivity. Presently Even the CLIA or NAT are not 100% compelling to distinguish every one of the cases in the window time frame, however they have especially decreased the transmission of TTI contrasted with past screening strategies.^{10,11}

In Developing countries like Pakistan, less than 0.5% of our population donates blood and among them only 0.05% are Voluntary donors. The need of hour is to increase motivation in voluntary blood donors as they have already gone through repeated screenings.⁽⁸⁾ Secondly, everybody should promote the transfusion of Blood screened by CLIA. This study is designed to see the prevalence of different causes of Donor Rejection Before and after Blood Donation, their statistically analyze the most common cause of Donor Deferral. we also analyzed the usefulness of CLIA technique over rational screening by kit method in detecting Borderline cases of TTI and to improve the screening techniques both Pre and post donation, in order to provide safe blood for transfusion as maximum as possible.

Methodology

The Descriptive study was carried out over a period of 02 years between March 2019 to February 2021 in the Blood Bank setting of Alkhidmat Raazi Hospital Rawalpindi Pakistan. The study was conducted according to the Code of Ethics and after taking permission from Ethical Review Board of Alkhidmat Raazi Hospital.

The Evaluation of voluntary Blood donors was done by using a Questionnaire that included questions of personal history of behaviors, traveling and medical conditions. After that, the intended blood donor

underwent a medical examination consisting of weight, height, vital signs and basic Blood tests for basic blood parameters including Blood group by Forward and Reverse grouping, and haemoglobin estimation, Platelet count and WBC count were performed using Mindray 5 part Hematology Analyser (Table I)

After initial procedure, Blood Donation was collected by using aseptic measures. The Blood sera was later screened for 5 TTI including malaria by Screening kit method and HCV, HBsAg, HIV and VDRL (Syphilis) by using CLIA (Chemiluminescence Immunoassay) technique on Roche Fully automated Analyser.

Table I: Donor Selection Criteria (WHO Guidelines)

CONDITION	RECOMMENDATION
Age	18 to 50 years
Hemoglobin	Male >13g/dl, Female >12g/dl
Blood pressure	Systolic 100 -140 mmHg, Diastolic 60 – 90 mmHg
Duration since last donation	Male 03 Months, Female 04 Months
Typhoid fever	12 Months after Recovery
Dengue	6 Months Deferral
Epilepsy	03 years off treatment and Without attack
Tuberculosis	02 years Deferral following confirmation of cure
Hypertension	Controlled on Medication is accepted
Diabetic	Accept Controlled DMM with Diet/oral medicine, Permanent Deferral for those on Insulin
HbsAg, Anti HCV, Anti HIV, Anti TP Positive, Cancer, Chronic disease	Permanent Deferral

Results

During this period of study, a total of 1849 donors were registered in Alkhidmat Raazi blood bank. Out of these 164 (8.8%) were rejected. The Donors were mostly between Age group of 25 to 45 years. Among the 164 Rejected Donors, 95(57.9%) were temporarily rejected whereas, 69(42.0%) were rejected permanently among the total rejected cases. (Figure 1)

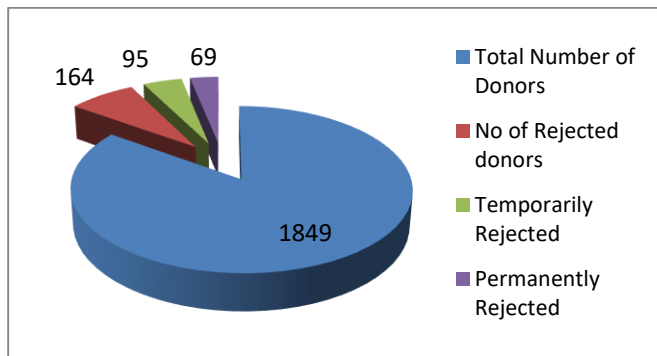


Figure 1. Frequency of Rejected Donors.

The Commonest cause of Rejection was Anemia; 51(31.01%) in temporary rejected donors and HbsAg Positive i.e. 24(14.6%) among permanently deferred cases, as shown in Table II.

One point worthy to be noted in Results was that the Number of borderline cases in HCV was 1 out of total 21 positive cases (4.7 %) and in HIV positive donors 5 out of 8 cases were in Window period (62.5%) which showed borderline results on CLIA, which is most striking finding in this study. (Table III)

Table II: Donor Deferral causes (Frequency wise)

Donor Deferral Causes	Total case n1 = 1849	Rejected cases n2= 164
Temporary deferral (Total = 95)		
Anemia	51 (2.7%)	51 (31.1%)
Low Platelets	29 (1.6%)	29 (17.6%)
High TLC	4 (0.2%)	4 (2.4%)
Hemoglobin (Increased)	4 (0.2%)	4 (2.4%)
HTN on medicine	2 (0.1%)	2 (1.2%)
Tuberculosis	2 (0.1%)	2 (1.2%)
Epilepsy	1 (0.05%)	1 (0.6%)
Increase Bilirubin	1 (0.05%)	1 (0.6%)
Low TLC	1 (0.05%)	1 (0.6%)
Permanent Deferral (Total =69)		
HBsAg Positive	24 (1.3%)	24 (14.6%)
Anti HCV positive	21 (1.1%)	21 (12.8%)
VDRL(Syphilis) Positive	16 (0.8 %)	16 (9.7%)
HIV positive	8 (0.4%)	8 (4.8%)

Table III: Number of Borderline cases

	Borderline cases (%age of Total cases)
Anti HCV (21 cases)	1 (4.7%)
HIV (8 cases)	5 (62.5%)

Discussion

Blood Bank services generally face the challenges of ensuring an adequate supply and maintaining the safety and quality of blood and its components. Blood provisions must be continually restocked due to narrow shelf lives. According to WHO, blood donation by a minimum of 1% of the population is required to meet a country's need. Nevertheless, the regular donation frequency is 15 times lesser in developing countries as compared to developed ones.¹¹

In Pakistan, the estimated yearly blood collection rate is 3.5 million. The data collected in 2013 for the WHO global database on blood safety estimated that for every 1000 population, the blood collection rate is 16.6. Voluntary blood donation frequency is only 10.6%, whereas 88.3% of the blood collected is through replacement donation.¹² This trend is opposite in developed nations, where voluntary non-remunerated blood donors, having a lower incidence of transfusion transmissible infections (TTI), cover more than 90% of donations.¹³

The blood donor selection process includes registration, completion of a donor questionnaire and pre-donation counselling, health and risk assessment consisting of general health, medical history, and travel history, indulgence in high-risk behaviors, past contact or exposure to infection, physical examination, measurement of body weight and vital signs (pulse, blood pressure), and proper informed consent. This should be practiced for every blood donor, with an objective of safeguarding the health of both the donor and potential recipients.^{4,14} According to WHO recommendations, the minimum TTI screening markers must include: for HIV-1 and HIV-2, screening for either a blend of HIV antigen-antibody or only anti-HIV antibodies, hepatitis B surface antigen (HBsAg), combination of HCV antigen-antibody or anti-HCV antibodies, screening for specific treponemal antibodies for Syphilis.¹⁴

The two types of donor deferrals include temporary, in which the donor is deferred for a specific period, defined according to the reason; and permanent, in which the donor is indefinitely deferred from donating blood.¹⁵

In the present study, among 1849 blood donors, 164 (8.9%) were rejected, which conforms to the other

studies from Pakistan which have reported donor deferral rate as 8 to 9.5%.⁸ The causes of permanent rejection mainly included transfusion transmissible infections namely HBV, HCV, HIV and Syphilis. Temporary rejected donors were mostly due to anemia and other alterations in blood counts according to predefined criteria such as thrombocytopenia and leukocytosis; as well as hypertension and recent history of tuberculosis.

Anemia, mainly due to iron deficiency, other nutritional causes and parasitic infestations, is a common public health issue and is frequent in Pakistani blood donors. Low hemoglobin is documented as a pre-donation cause for deferral in our study since the hemoglobin of the donor is estimated first, once the donor is eligible after medical history and examination. Our study showed that 51 (2.76%) of total donors and 31% of rejected donors were anemic. This implies that many people in our population are unaware of their basic hemoglobin status despite it being a cheap, rapid and readily available test. In another study from India, similar to ours, anemia constituted 1.21% of total donors.¹⁵ Tufail et al. from Pakistan noted low hemoglobin as a cause of rejection in 4.9% of all donors and 36.1% of rejected donors.⁸ A broad study conducted in the US to assess the association between the demographic factors and anemia in blood donor deferrals revealed late age in males, female gender, and African-American ethnicity to be considerable factors.¹⁶

Polycythemia comprised 0.22% of our donor deferrals, making 2.4% of the rejected donor population. This may mainly be attributed to smoking, which is very common in our male population as well as dehydrated state. In a study conducted in Jeddah, Abdelaal et al.¹⁷ demonstrated that deferral due to high hemoglobin was 0.4%, whereas another study reported this rate to be much higher at 7%.¹

Similarly, another hematological abnormality namely thrombocytopenia was a cause of temporary deferral in 29 (1.57%) of our total donors, and 17.6% of rejected donors. In contrast, in a study conducted in Multan, Pakistan, low platelet count as a cause of deferral was found to be much lower than that found in current study (0.4% of total donors recruited in study and 3.5% of deferred donors)¹⁸ Some studies from Pakistan portrayed similar results to them. Sultan et al. showed that thrombocytopenia was the least (0.08% of total and 1.0%

of deferred donors) encountered cause of deferral in their study.¹⁹ However, Tufail *et al.* detected low platelet count in 1.8% of donors (13.6% of deferred donors) in their series, which is nearly similar to our findings.⁸

Leukocytosis (total leucocyte count of more than $11 \times 10^3/\mu\text{l}$) was observed in only four (0.22%) deferred donors. In another study, raised TLC was seen in 3.7% of donors. This finding is an indirect gauge for underlying or occult infection, and must be evaluated on a regular basis in all blood donors.¹⁹ The AABB has not determined the acceptable limits for TLC and platelet count for potential donors yet.²⁰ Nonetheless, it seems a logical decision to set appropriate ranges for these parameters based on demographic status. These donors should be temporarily rejected and referred to hematologist for appropriate workup and management.¹⁹

Miscellaneous rare causes of donor deferral found in our study included hypertension, epilepsy and history of tuberculosis, which comprised 0.11%, 0.05% and 0.11% of donors respectively.

Screening for transfusion transmissible Infections is an essential part of donor assessment and it is recommended that highly sensitive techniques are applied for their detection to avoid missing the positive cases. This screening is generally carried out post-donation. In cases of positive or borderline results, the donors are permanently rejected, counselled and referred for management. TTIs are more common in high-income countries than in low-income countries. It is reported that the prevalence of HIV, HBV, HCV and Syphilis in high-income countries is 0.003%, 0.03%, 0.02% and 0.05% respectively. Whereas, in low-income countries, this rate is higher at 1.08, 3.70, 1.03 and 0.90% respectively. This difference may correlate with the disparity in the occurrence of these diseases in diverse areas.²¹ In our study the overall prevalence of TTI among donors was 3.7%, while individually, the prevalence of HIV, HBV, HCV and Syphilis was 0.43, 1.30, 1.14, and 0.87% respectively. No malaria-infected donor was observed in our study. This infectivity rate is due to higher number of replacement donor population as compared to voluntary donors. These results are similar to another study from Pakistan, which reported the overall incidence of HIV, HBV, HCV and Syphilis to be 0.04, 1.84, 1.7 and 2.1% respectively.²² In another study, the overall rate of TTI's was 4.25% and showed a much

References

higher prevalence of HCV infectivity (3.1%).⁸ In another study from India, the cumulative seroprevalence of these infections was 0.42, 1.24, 0.62 and 0.65% respectively.²³

The current study demonstrated that out of 69 permanently rejected donors due to HCV, HBV, Syphilis and HIV, one case of HCV and five cases of HIV were borderline. These infections were detected by using CLIA (Chemiluminescence immunoassay) technique, which detected those donors in window period, which would have been missed if only less sensitive techniques such as Immunochromatography kit method were used, as is commonly done in lower health setups in Pakistan. More infectivity rate would have been observed if more sensitive method such as Nucleic Acid testing (NAT) or PCR were carried out for confirmation of negative cases as these further shorten the window period of infectivity.

There has not been a documented transfusion-related case of hepatitis C in the United States for more than ten years now because all blood donations are strictly screened for TTIs with both ELISA and PCR techniques. In a study by Tufail et al., few donors with a weak positivity of anti-HCV were documented, which could be missed by first line basic screening methods.⁸

24

Conclusion

Blood donor deferral is a noteworthy problem in our country. The most common cause of deferral found in our study was low hemoglobin, followed by thrombocytopenia and infections like hepatitis B, hepatitis C, Syphilis and HIV. Other less common causes include leukocytosis, hypertension, and prior history of Tuberculosis, polycythemia, epilepsy and jaundice. One striking finding observed in this study was that 4.7% HCV positive and 62.5% HIV positive donors were in Window period, which showed borderline results on CLIA. Thorough screening and evaluation of blood donors, effectively implemented use of donor questionnaire and physical examination, option of self-deferral, pre-donation Complete Blood Count check, trained blood bank staff and state of the art sensitive equipment for TTI screening such as CLIA and NAT are essential tools for ensuring safe blood collection and transfusion for both the donors and recipients.

1. AINouri AK, Maghrabi LA, Hamdi SS, Abd El-Ghany SM, AINouri KA. Analysis of the most common causes of blood donor deferral in northern Jeddah: a single-center study. *J Blood Med*. 2019;10:47-51. doi:10.2147/JBM.S178822.
2. Tariq S, Tariq S, Jawed S, Tariq S. Knowledge and attitude of blood donation among female medical students in Faisalabad. *J Pak Med Assoc*. 2018;68(1):65–70.
3. Department of Essential Health Technologies Blood Transfusion Safety Unit. *Universal Access to Safe Blood Transfusion*. Geneva: World Health Organization; 2008.
4. World Health Organization. *Blood Donor Selection: Guidelines on Assessing Donor Suitability for Blood Donation*. Geneva: World Health Organization. 2012. 16–23.
5. Stokx J, Gillet P, De Weggheleire A, Casas EC, Maendaenda R, Beulane AJ, Jani IV, Kidane S, Mosse CD, Jacobs J, Bottieau E. Seroprevalence of transfusion-transmissible infections and evaluation of the pre-donation screening performance at the Provincial Hospital of Tete, Mozambique. *BMC Infect Dis*. 2011;11:141.
6. Dodd RY: Current risk for transfusion transmitted infections. *Curr Opin Hematol*. 2007;14: 671-676.
7. Maresch C, Schluter PJ, Wilson AD, Sleigh A. Residual infectious disease risk in screened blood transfusion from a high-prevalence population: Santa Catarina, Brazil. *Transfusion*. 2008; 48: 273-281
8. Tufail S, Babar F, Ikram N, Raza M, Abdul-Shakoor H. Blood donors deferral-causes. *J Rawalpindi Med Coll*. 2013;17:119–21
9. Chaurasia R, Zaman S, Das B, Chatterjee K. Screening Donated Blood for Transfusion Transmitted Infections by Serology along with NAT and Response Rate to Notification of Reactive Results: An Indian Experience. *J Blood Transfus*. 2014;2014:412105.
10. Hans R, Marwaha N. Nucleic acid testing-benefits and constraints. *Asian J Transfus Sci*. 2014;8:2-3.
11. Towards 100% Voluntary Blood Donation: A Global Framework for Action. Geneva: World Health Organization; 2010. 2, Voluntary blood donation: foundation of a safe and sufficient blood supply. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK305666/>
12. Waheed U, Azmat M, Zaheer HA. Knowledge, attitude and practices towards blood donation in Pakistan: A nationwide survey. *Hematol Transfus Int J*. 2015;1:83-86.
13. Enawgaw B, Yalew A, Shiferaw E. Blood donors' knowledge and attitude towards blood donation at North Gondar district blood bank, Northwest Ethiopia: a cross-sectional study. *BMC Res Notes*. 2019;12:729.
14. Blood Donor Selection: Guidelines on Assessing Donor Suitability for Blood Donation. Geneva: World Health

- Organization; 2012. 7, TTI and donor risk assessment. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK138223/>
15. Basavarajegowda A. Whole blood donor deferral causes in a tertiary care teaching hospital blood bank from South India. *Hematol Transfus Int J.* 2017;5:219–222.
 16. Mast AE, Schlumpf KS, Wright DJ, et al. Demographic correlates of low hemoglobin deferral among prospective whole blood donors. *Transfusion.* 2010, 50:1794-802.
 17. Abdelaal M, Anwar F. Analysis of blood donor deferral in Jeddah, Saudi Arabia: characteristics and causes. *J Pak Med Assoc.* 2016;66:1392–1395.
 18. Iqbal H, Tameez Ud Din A, Tameez Ud Din A, Chaudhary FMD, Younas M, Jamil A. Frequency and Causes of Deferral among Blood Donors Presenting to Combined Military Hospital Multan. *Cureus.* 2020;12:e6657.
 19. Sultan S, Irfan SM, Baig MA, Usman SM, Shirazi UA. Insight into donor deferral pattern based on peripheral blood counts: An experience from South Pakistan. *Asian J Transfus Sci.* 2017;11:151-155.
 20. Fung MK, Grossman BJ, Hillyer C, Westhoff CM, editors. *AABB Technical anual.* 18th ed. Bethesda (MD): AABB; 2014.
 21. Aabdein M, Selim N, Himmat S. et al. Prevalence and trends of transfusion transmissible infections among blood donors in the State of Qatar. *BMC Infect Dis.* 2020; 20: 617
 22. Arshad A, Borhany M, Anwar N, Naseer I, Ansari R, Boota S et al. Prevalence of transfusion transmissible infections in blood donors of Pakistan. *BMC Hematol.* 2016;16:27
 23. Mandal R, Mondal K. Transfusion transmissible infections among blood donors from a sub-Himalayan rural tertiary care center in Darjeeling, India. *Journal of traditional and complementary medicine.* 2016;6:224-9
 24. Rehman MU, Akhtar GN, Qadeer M. Safe blood begins with safe donors. *Pak J Med Sci.* 2003; 19: 161-68