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Original Article

Transmissible Infection Profile and Hematological Parameters in Healthy Blood Donors and Trends in Unsuitability for Blood Donation

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Abstract

Objective: This study assessed the prevalence of HIV, syphilis, dengue, malaria, HBV, HCV, and other transfusion-transmitted infections (TTIs) among healthy blood donors in Rawalpindi, Pakistan.

Methods: This study examined blood donors who visited the Al-khidmat Raazi Diagnostic and Blood Bank between January and September of 2022. Blood donors underwent tests for dengue, malaria, syphilis, HIV, HBV, and HCV. To separate serum from blood, 5 ml of blood is collected in a sterile test tube and centrifuged at 3500 rpm for 5 minutes. Using ICT, screening was done for HbsAg, anti-HCV, anti-syphilis, and anti-HIV antibodies.

Results: Ninety percent of the blood donors had typical physical characteristics. Male donors made up all 298 (100%) of the healthy donors. Over the course of nine months, TTIs were tested for in 298 healthy blood donors. In our study, replacement donors made up 80% of the blood donors. The prevalence of malaria, dengue, HBV, HCV, HIV, syphilis, and other diseases was determined to be 12.5%, 13.4%, 12.8%, 6.7%, 0.7%, and 21.5% respectively. The hemoglobin level of 260 blood donors (87%) was 13mg/dl.

Conclusion: Donors frequently experience TTIs. Inadequate screening leads to transfusion-transmissible illnesses in healthy blood donors. Safe health practices and appropriate TTI screening could lower blood donors' risk of contracting communicable illnesses. To avoid unintentional transfusion reactions in both the recipient and the donor, the hospital must thoroughly screen donors for TTIs and unfitness.

Keywords: TTIs infection, HBV, Blood donor, Syphilis, Malaria, HBV, Dengue, HIV

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Introduction

A blood donor is a person who presents as healthy but donates blood so that others can receive medical care.[1] The primary blood donor classes, or foundations, include commercial blood donors, family replacement donors, and above all the category of voluntary blood donors.[2] The main objective of any transfusion is to supply the portion of blood that is needed for life but undersupplied in a patient's circulation. Blood transfusions are a dangerous patient management technique used in modern medicine to save lives, but they also carry significant risks for both donors and recipients.[3] Donor erythrocytes and all additional blood components must match the patient's lifeblood exactly in order to achieve this goal as best as possible.[4] The tragic circumstances that can happen make blood protection a top global issue. The criteria used for selecting blood donors is one of the most important steps in ensuring blood safety.[5]

The specific requirements for blood donor eligibility are determined by a thorough medical examination, which is based on national and international standards, as well as donor preference. The following factors are

taken into consideration when choosing a potential donor: weight, age, systolic and diastolic blood pressure (Bp), normal temperature, hemoglobin (Hb) level, and normal pulse rate.[6] The potential blood donor cannot have acute cardiovascular disease, respiratory conditions, epilepsy, or abnormalities of the central nervous system (CNS).[4] The requirement for blood donors is free of constrictions and blood transfusion-transmittable infections. Pregnant and nursing women have a high need for iron, thus they have temporarily banned them from donating blood in order to accommodate the needs of both mom and baby.[7] The World Health Organization has recommended that blood donation be voluntary at all times and motivated by the selfless goal of preserving the recipients' lives. To be acknowledged as blood donors for medicinal purposes, however, potential donors must be in good health.[8]

A routine test called a hematologic profile counts the number of each distinct type of cell in a blood sample by estimating it for a few basic blood cell measurements. The total Hb and the numbers of red blood cells, platelets, and white blood cells are determined by a hematology test.[9] Anemia is a disorder that is often brought on by the patient having insufficient iron, and the Hb and RBC tests are crucial in identifying this.[10] Certain situations can be revealed by a WBC test.[11] It is possible for contagions, manufacturing failure, hematologic pre-malignant, and clonal disorders to be indicated by low or high WBC levels. Hemostatic diseases can be caused by either low or high platelet counts, and individuals with larger total WBC cell counts than normal are typically suspected of having a bacteriological infection.[12] RBCs transport oxygen from the lungs to create tissues, and they also play the important function of removing carbon dioxide from the body's tissues and structures by transporting deoxygenated red blood cells back to the lungs. On the other hand, WBC cells play a critical role in the blood brook infection response, either directly by phagocytosis or indirectly through mediated immunity.[12,13] The evaluation of the blood donor's hematological parameters is crucial in determining who is a qualified blood donor for constituent donations in order to maximize the benefits of blood transfusion facilities.[14]

Many lives are saved by blood donation every year, but both donors and recipients run the risk of contracting transfusion-transmitted illnesses (TTIs), which presents major obstacles for medical professionals trying to provide patients with affordable, safe blood products. Harmless blood is a universal right, according to the WHO.[15] A national program for donor selection, staffing, retention, and education is essential to the procurement of innocuous blood; it will reduce contributions from donors who actively transmit diseases to the recipients. Evaluating the prevalence and risk factors of TTIs in the general population is also crucial.[1] Due to a number of factors, including a lack of concern, the unavailability of screening tests, limited access to healthcare facilities, and the lack of surveillance systems, the exact number of TTIs in our population (Pakistan) is still unknown.[16]

Furthermore, voluntary blood donors have been said to be the safest category of donors since, on average, they exhibit healthier lifestyle choices than replacement donors. Although 1.5 million units of blood are collected annually in Pakistan, the majority of these donors are replacement donors, who are usually close friends or family members of the patient and who are willing to assist with transfusions in emergency situations.[17] The supply of safe blood products is desperately needed. This calls for top-notch transfusion facilities, a well-organized support system, and appropriately qualified and educated personnel.[18] As previously noted, there is a concerning prevalence of both the Hepatitis B and Hepatitis C viruses in Pakistan (HCV: 4.9% and HBV: 2.5%).[19] Nonetheless, new research has raised concerns about the rising frequency of TTIs other than HBV and HCV, namely HIV and syphilis.[20,21] This study assessed the prevalence of HIV, syphilis, dengue, malaria, HBV, HCV, and other transfusion-transmitted infections (TTIs) among healthy blood donors in Rawalpindi, Pakistan.

Methods

This study examined blood donors who visited the Alkhidmat Raazi Diagnostic and Blood Bank between January and September of 2022. Prior to data collection, all blood donors must complete an online questionnaire covering topics such as lifestyle, past blood donations, chronic illness, and general health. The study comprised blood donors who were at least 50 kg in weight, had hemoglobin levels equal to or greater than 12 mg/dl, and were older than 20 years old. Blood donors who didn't fit the requirements weren't included in this study. Excluded are those who have not donated blood in less than three months, drug users, and sex workers. The study also eliminated patients with a history of syphilis, dengue, HIV, malaria, and HBV/HCV. Additionally, the patient completed the written consent form before to the study's commencement. Blood donors underwent tests for dengue, malaria, syphilis, HIV, HBV, and HCV. To separate serum from blood, 5 ml of blood is collected in a sterile test tube and centrifuged at 3500 rpm for 5 minutes. Using ICT, screening was done for HbsAg, anti-HCV, anti-syphilis, and anti-HIV antibodies.

ICT is a straightforward kit test that determines if an antigen or antibody, the target analyte, is present in a sample or not. The ICT kit is made up of four basic parts: the conjugate comes first, followed by the sample pad, where a sample is inserted.

Antibodies are coated in this kit area. Additionally, the

sample runs through a nitrocellulose membrane with two lines (a test line and a control line) and an absorbent pad at the end. To find out whether or not a sample contains antigens or antibodies, it is placed on a sample pad. Captured antibodies are coated on a conjugation pad; colloidal gold particles are coupled with captured antibodies if an antigen is present in the patient sample it will conjugate with captured antibodies.

The antigen-antibody complex travels along a Test line and a Control line on a nitrocellulose membrane. Primary antibodies, also known as monoclonal antibodies, that are exclusive to the antigen and antibody found in the patient sample are coated on the test line. When the antigen-antibody complex binds to the primary antibody, a positive test result is indicated by the production of color. Secondary antibodies specific to the collected antibodies are coated on the control line. Therefore, in every test, the control line is always positive. The ICT approach and thick films were used to identify the malarial parasite.

Results

A total of 298 healthy Blood donors were screened for TTIs. All 298 (100 %) healthy blood donors were male [Figure 1].

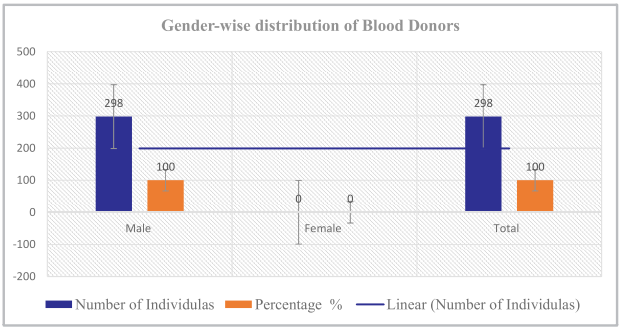

Figure 1: *Gender Wise Distribution of blood donors*

The overall combined prevalence of all TTIs among blood donors is 11.1 % and among this syphilis (21.5%) was more prevalent among donors followed by HCV (13.4 %) and HIV (12.8 %) while Dengue (0.7 %) was the least prevalent among donors. [Figure 2].

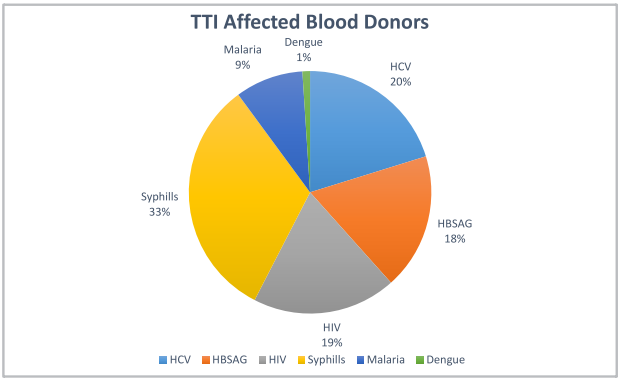

Figure 2: *TTIs Affected Blood Donors*

Among all the donors 90 % of blood donors were with normal physical appearance [Table 1].

Table 1: *Appearance-wise distribution of blood donors*

Physical appearance	Number of individuals	Percentage %
Normal	268	90
Erythema	3	1
Jaundice	7	3
Albino	3	1
pallor	6	2
Hyperpigmentation	3	1
Cyanosis	6	2
Total	298	100

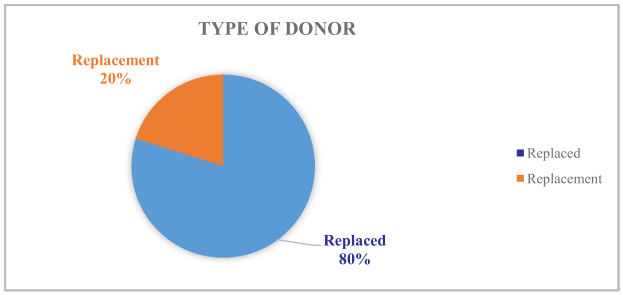

Figure 3: *Type of Blood Donor*

Among all 298 blood donors, the hemoglobin level of 260 (87 %) blood donors was 13 mg/dl or more than 13 mg/dl, and 38 (13 %) blood donors had Hb level <13 mg/dl. All the donors with Hb >13 mg/dl were eligible for blood donation [Figure 4].

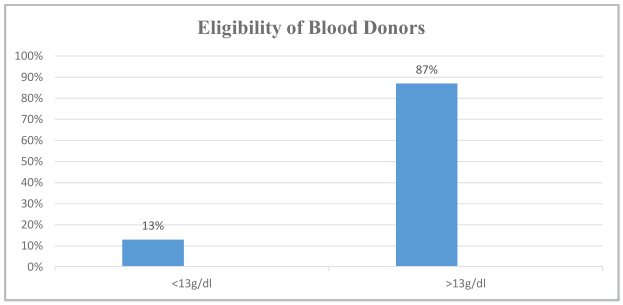

Figure 4: *Eligible Blood Donors*

Discussion

This study reveals that the liking towards donation was pointedly less in females as compared to males. Likewise the place of habitation, economic, level of education of the family had strong impact on blood donation practices. This study statistics regarding gender-wise distribution are different from a study conducted in 2019 that reported that out of 384 participants, 67.2 % were male and 32.8% were female, with 31.21 to 11.56.[22] The current study are similar with others national and international researches as a study shown in South East

Botswana stated that out of all contributors only 27.1% had donated blood in the past while only 9 .6 % were regular blood donors and out of donor's majority gone to secondary and tertiary level of education.[23]

According to the World Health Organization (WHO) screening of blood donors is performed for five WHO recommended Transfusion Transmitted Infections (TTIs) including HBV, HCV, HIV, syphilis, and Malaria. Most of the blood donors in our study were replaced donors (80%) than replacement donors (20%). However, blood donors in other studies are mostly replacement donors.[24] In our study, the seroprevalence of syphilis is very high (21.5%) followed by hepatitis C virus (13.4%) and Human Immunodeficiency virus HIV (12.8%).

A similar study was conducted in India which shows the prevalence of TTIs as HIV (0.44%), HbsAg (1.27%), HCV (0.23%), and syphilis (0.28%)[24]. A study conducted in Brazil from 2010 to 2016 depicted the prevalence of HBV, syphilis, HCV, HIV, and Chagas disease as 48.11%, 26.85%, 13.66%, 7.05% and 6.69% among 137,209 blood donors.[25] In our study, there is a significant increase in seroprevalence of syphilis which is compared with a local study which also has a rising seroprevalence of 2.1%.[26] A study conducted in Iran also represents the increasing trends of syphilis in healthy blood donors however the frequency of syphilis was 0.04%.[27] Moreover, according to different studies conducted in India, there is a very low prevalence of syphilis.[28,29]

Syphilis; a sexually transmitted disease also increases the chances of Human immuno-deficiency virus (HIV).[30] Syphilis is caused by the spirochete bacteria Treponema pallidum and it is the most prevalent sexually transmitted disease in both developed and developing countries. The frequency of Replaced donors (80 %) was higher in our study than Replacement donors (20%). Similar study reported by jaffary et al in 2019 reported that 62 % were replaced donors.[22] The current study conducted on the wide-ranging population revealed that trend of voluntary unpaid donation is almost fictional as majority of blood donors and receivers were either the family members or the friends.

Conclusion

The prevalence of syphilis in healthy blood donors might be due to bad health practices. Transfusion transmissible infections in healthy blood donors are the consequence of a lack of proper screening. Proper screening of TTIs and ensuring safe health practices could reduce the risk of transmissible infections in blood donors. In our culture the practice of unpaid donation is extremely poor. Strategies should be developed to stimulate and educate the non-donors and women to donate blood on regular basis.

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Conflict of Interest: *None*

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References

1. Buseri FI, Muhibi MA, Jeremiah ZA. Sero-epidemiology of transfusion-transmissible infectious diseases among blood donors in Osogbo, south-west Nigeria. Blood Trans. 2009;7(4):293.
2. Nwogoh B, Ikpomwen OD, Isoa EM. Donor blood procurement and the risk of transfusion transmissible viral infections in a tertiary health facility in South-South Nigeria. Niger Med J. 2011;52(4):227-9.
3. Vamvakas EC, Blajchman MA. Transfusion-related mortality: the ongoing risks of allogeneic blood transfusion and the available strategies for their prevention. Blood, J Am Soc Hematol. 2009 Apr 9;113(15):3406-17.
4. Neale BM, Sham PC. The future of association studies: gene-based analysis and replication. Am J Human Genetics. 2004;75(3):353-62.
5. Shabala L, Ross T, Newman I, McMeekin T, Shabala S. Measurements of net fluxes and extracellular changes of H+, Ca2+, K+, and NH4+ in Escherichia coli using ion-selective microelectrodes. J Microbiol Methods. 2001;46(2):119-29.
6. Giblin AE, Tobias CR, Song B, Weston N, Banta GT, H. RIVERA-MONROY VI. The importance of dissimilatory nitrate reduction to ammonium (DNRA) in the nitrogen cycle of coastal ecosystems. Oceanography. 2013;26(3):124-31.
7. Oswald I. Selection and Counselling. British Med J. 1964;1(5396):1497.
8. Alavi-Moghaddam M, Bardeh M, Alimohammadi H, Emami H, Hosseini-Zijoud SM. Blood transfusion practice before and after implementation of type and screen protocol in emergency department of a university affiliated hospital in Iran. Emerg Med Int. 2014; 2014 (1): 316463.
9. Webb J, Lu W, Delaney M. Hemolytic disease of the fetus and newborn. Rossi's Principles of Transfusion Medicine. 6th Ed. 2022:p.364-72.
10. Collaboration AT, Aad G, Abat E, Abdallah J, Abdelalim AA, Abdesselam A, Abdinov O, Abi BA, Abolins M, Abramowicz H, Acerbi E. The ATLAS experiment at the CERN large hadron collider. J Instrum. 2008; 3(S): 8003-8.
11. Yasuda H, Kondo I, Sato N. A study of factors influencing the perception of burden and subjective well-being in Japanese family caregivers of the impaired elderly. Japanese J Rehabilit Med. 2001;38(6):481-9.
12. Sanchis-Gomar F, Cortell-Ballester J, Pareja-Galeano H, Banfi G, Lippi G. Hemoglobin point-of-care testing: the HemoCue system. J Lab Autom. 2013;18(3):198-205.

13. B J Bain, I Bates, M A Laffan, S M Lewis. Dacie and Lewis. 2012.

14. Chen Y, Wang X. 基因的改变NIH Public Access. J Am Heart Assoc.2008;117(25)1-21.

15. Gharehbaghian A. An estimate of transfusion-transmitted infection prevalence in general populations. Hepat Mon. 2011;11(12):1002-3.

16. Attaullah S, Khan S, Khan J. Trend of transfusion transmitted infections frequency in blood donors: provide a road map for its prevention and control. J Transl Med. 2012;10(1):1-5.

17. Motayo BO, Faneye AO, Udo UA, Olusola BA, Ezeani I, Ogiogwa JI. Seroprevalence of transfusion transmissible infections (TTI), in first time blood donors in Abeokuta, Nigeria. Afr Health Sci. 2015;15(1):19-24.

18. Manzoor I, Hashmi N, Daud SE, Ajmal SA, Fatima HI, Rasheed ZA, Syed SA. Seroprevalence of transfusion transmissible infections (TTIS) in blood donors. Biomedica. 2009;25(10):154-8.

19. Arshad A, Borhany M, Anwar N, Naseer I, Ansari R, Boota S, Fatima N, Zaidi M, Shamsi T. Prevalence of transfusion transmissible infections in blood donors of Pakistan. BMC Hematol. 2016;16(1):1-6.

20. Zou S, Notari EP, Fang CT, Stramer SL, Dodd RY. Current value of serologic test for syphilis as a surrogate marker for blood-borne viral infections among blood donors in the United States. Transfusion. 2009; 49(4): 655-61.

21. Ghafoor MB, Hussain M, Leghari AR, Mehwish A, Zulfiqar S, Mustafa G. Major transfusion-transmissible infections among blood donors in rahim yar khan, a district of southern Punjab, Pakistan. Isra Med J. 2016; 8(4):246-8.

22. Jaffry TN, Khalid S, Tariq N, Fiaz A, Zafar S, Yasir S. Socio-Demo-graphic Factors Influencing Voluntary Blood Donation in General Population of Islamabad. Pakistan. J Community Med Public Health Care. 2019; 6(3):055.

23. Ahmed Z, Zafar M, Khan AA, Anjum MU, Siddiqui MA. Knowledge, attitude and practices about blood donation among undergraduate medical students in Karachi. J Infect Dis Ther. 2014;2(2):2-5.

24. Chandekar SA, Amonkar GP, Desai HM, Valvi N, Puranik GV. Seroprevalence of transfusion transmitted infections in healthy blood donors: A 5-year Tertiary Care Hospital experience. J Lab Physcian. 2017;9(04):283-7.

25. Pessoni LL, Aquino ÉC, Alcântara KC. Prevalence and trends in transfusion-transmissible infections among blood donors in Brazil from 2010 to 2016. Hematol Transfus cell Ther. 2019;41:310-5.

26. Waheed U, Khan H, Satti HS, Ansari MA, Malik MA, Zaheer HA. Prevalence of transfusion transmitted infections among blood donors of a teaching hospital in Islamabad. Ann Pak Inst Med Sci. 2012;8(4):236-9.

27. Aslani J, Khedmat H, Assari S, Khoddami-Vishte HR, Alaeddini F, Einollahi B, Simforoosh N. Transplantation research in Iran: a bibliometric study. In Transplant Proceed. 2007;39(4):788-9).

28. Prakash P, Bobati S, Basavaraj V. Prevalence of transfusion transmissible infections among blood donors in a tertiary care hospital of Mysuru District–a six years study. Int J Trop Dis Health. 2016;16(3):1-8.

29. Divyashree BN, Sankar S, Khanna RM. Sero-prevalence and trends of transfusion transmissible infections among blood donors in a rural tertiary care centre-A 7 years study. Indian J Pathol Oncol. 2020;7(4):576-81.

30. Nazir S, Pracha HS, Khan A, Nazar A, Fayyaz A, Khan MS, Ahmed S, Masood F, Yaqub T, Rakha A. Prevalence of syphilis in Pakistani blood donors. Adv Life Sci. 2013;1(1). 27-30.