



ORIGINAL ARTICLE

Seroprevalence of transfusion-transmissible infections by type and their distribution across gender in blood donors, a regional blood center study, Pakistan.

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ABSTRACT... Objective: To determine the prevalence and distribution by gender of Transfusion transmissible infections (TTIs) in blood donors. **Study Design:** Cross-sectional study **Setting:** Department of Community Medicine, GMC. **Period:** July 18, 2022 to November 18, 2022. **Material & Methods:** The data collecting tool was a structured proforma. A sample of 3329 was calculated with a 0.71% margin of error, a 95% confidence level, and an expected prevalence of TTIs of 4.61%. Consecutive non probability sampling technique used. Nominal variables were gender, type of donors, presence of TTIs and types of TTIs. Counts and percentages with 95% confidence intervals were used to describe the prevalence and distribution. Chi-square goodness of fit was used to compare expected values with observed values. SPSS version 21 was used for data analysis. **Results:** Out of sample of 3329, TTIs positive cases were 174 (5.22%) with 95% CI of 4.51- 5.93%. All the positive cases were males. The prevalence for Hepatitis B, Hepatitis C, HIV, Syphilis, and Malaria was 2.2%, 0.9%, 0.3%, 1.9%, and 0.1% respectively. Our observed values for Hepatitis B&C, HIV and malaria were not statistically significantly different from expected values except for syphilis. **Conclusion:** Prevalence of TTIs was 5.22% with significantly higher prevalence of syphilis as compared to expected prevalence.

Key words: Blood Transfusion, Blood Donors, Hepatitis B, Malaria, Prevalence.

INTRODUCTION

Blood transfusion is an integral part of health services. Every year, blood transfusions save millions of lives all around the world. Due to the lack of an artificial substitute, blood is one of the most significant components of medical and surgical treatment.¹ According to the WHO, the blood donation rate is 31.5% donations in high-income countries, 15.9% donations in upper-middle-income countries, 6.8% donations in lower-middle-income countries and 5.0% donations in low-income countries.² Blood transfusion, on the other hand, is connected with a number of risks that might result in a wide range of adverse results. Hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), treponema pallidum (TP), and malaria parasite (MP) can all be transmitted to recipients by blood transfusion.³

Pakistan, being a developing country, carries a high burden of infectious diseases.¹ Additionally, Pakistan has a high demand for blood transfusions, notably for patients with thalassemia, hemodialysis, and hemophilia, as well as in cases of injuries and different emergencies. Approximately 100,000 thalassemia patients are dependent on blood transfusions and are at risk of TTI. This may shorten their lifespan.⁵

According to the World Health Organization, safe blood is a universal right, hence all donated blood must be tested for HBV, HCV, HIV, and syphilis. TTIs prevention is a major difficulty in low-income nations because resources are not always available, even when rules, legislation, guidelines, and strategies are in place. Even though Pakistan has legislation mandating TTIs screening, disease transmission continues, owing

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to the screening assay's failure to detect infection during the window phase.⁶ The increased risk of getting TTIs in the Pakistan is attributed to several factors, including widespread use of low-quality screening kits, a poor hemovigilance system, a high proportion of replacement donors, and a higher rate of blood-borne hepatitis in the general population.^{7,8,9,10}

According to a report by the World Health Organization (WHO), 257, 71, and 36.7 million people worldwide are living with chronic HBV, HCV, and HIV infections, respectively. The HBV epidemic mostly affects the WHO African Region, with a prevalence of 6.1 percent.¹¹ post-transfusion hepatitis affects about 12.5% of people who get blood transfusions.¹² A study in India showed 1.12% were reactive for TTIs in the screening assays.¹³

According to the United States' Centers for Disease Control and Prevention (CDC), HBV is 10 and 100 times more infectious than HCV and HIV, respectively.¹⁴ In Pakistan, nine million people are infected with HBV, ten million with HCV, and between 97,000 to 125,000 people are infected with HIV.¹⁵

To the best of our knowledge, no previous study of TTIs prevalence and its distribution by gender among blood donors who visited the Regional Blood Centre in Dera Ismail Khan is available. So, our objective was to fill this knowledge gap by determining the overall frequency of TTIs and frequency by type i.e., Hep B, Hep C, HIV, Syphilis and malaria in blood donors at regional blood center D.I. Khan, Pakistan. Other objective was to determine any significant difference between our observed values and what we expect based on previous studies.

MATERIAL & METHODS

This cross-sectional research project lasted from July 18, 2022, through November 18, 2022. It was conducted in the Department of Community Medicine, G.M.C. Data was collected from Regional Blood center of D.I. Khan. Ethical approval letter No 5442 was issued by ethical review committee of the institute. Confidentiality

was maintained.

With a 0.71% margin of error, a 95 % confidence level, estimated population of 18 to 50 years to be 56685 and an assumed TTI prevalence of 4.61%¹⁶, a sample size of 3326 people was determined using the Rao soft online sample size calculator. Sampling technique was the non-probability consecutive. Our inclusion criteria were potential donors aged between 18 to 50 years, with Hb level in between 12.5 to 17.5 g/dl and weight greater than 50 kg. Our exclusion criteria were donors who were febrile, had a long history of using aspirin, history of jaundice, are diabetic or hypertensive, had a septic prick within last 6 months and professional donors. This was exactly the criteria followed by regional blood center. The data was collected by a group of 4th year students from donors and records of blood donors visiting regional blood center. Our research variables were presence of TTI (Yes or No), type of TTI (Hep B, Hep C, HIV, malaria, and syphilis) in blood donors. Sociodemographic variable was gender (Male and Female).

Tests used for screening HIV, Hepatitis B, Hepatitis C, syphilis were CLIA waived test, ICT malaria plasmodium vivax test for rapid immuno chromatographic assay manufactured ion test card form.

All research and sociodemographic variables were nominal and described as frequency and percentages and 95% confidence interval for proportion.

Chi- square goodness of fit test was used to see any statistically significant difference between observed and expected values.

RESULTS

Our study included 3329 blood donors. Out of 3329 donors, 3263(98%) were males and 66 were females (2%), 174 (5.22%) had TTIs and all of them were males, while 3155 (94.77%) did not have TTIs. Thus, the overall prevalence of TTIs in sample was 5.22%.

From the 174 donors who tested positive for TTIs (5.22 percent), 72 (41.37 %) tested positive for HBV, 29 (16.67 %) for HCV, 9 (5.172 %) for HIV, 62 (35.63 %) for syphilis, and 2 (1.144 %) for malaria. As a result, HBV accounted for the majority of cases.

Observed Vs Expected Prevalence of TTIs in Blood donors

Our expected percentage and counts of TTIs positive cases were 4.61%, 1929 positive cases out of sample of 41817 total donors in a study by Saba N et al.¹⁶ Our observed values were 174 positive cases (5.2%) out of 3329 total donors. With different sample sizes, to make these comparable, expected frequencies were adjusted for sample size of 3329. So expected counts for presence and absence of TTIs came out to be 153: 3176 for a sample of 3329. Our observed counts for of TTIs (Yes: No) from a sample of 3329 were 174: 3155.

With a chi-square goodness of fit value of 3.021 and p value 0.08, our observed values were not statistically significantly different from expected values.

The p-value for the chi-square goodness of fit test was higher than 0.05, demonstrating that the observed and expected prevalence were not statistically different.

Observed Vs Expected prevalence of Hepatitis B

Our adjusted expected counts for hepatitis B were 65 out of total TTIS positive 153 cases for a sample of 3329 as mentioned in above paragraph. Our observed counts for presence of Hepatitis B were 72 out of total TTIs positive 174 cases from a sample of 3329.¹⁶ With a chi-square goodness of fit value of 0.769 and p value 0.38, our observed values were not statistically significantly different from expected values.

Observed vs expected prevalence of hepatitis C

Our adjusted expected counts for hepatitis C were 46 out of total TTIS positive 153 cases for a sample of 3329. Our observed counts for presence of Hepatitis B were 29 out of total TTIs positive 174 cases from a sample of 3329. Values of Saba N are adjusted to make these comparable.¹⁶

Variable	Attributes	Sample Statistics		95% CI for Proportion	
		Count	Percentage	Lower	Upper
Presence of TTI	Yes	174	5.22%	4.51%	5.93%
	No	3155	94.773%	94.063%	95.48%
	Total	3329	100%		

Table-I. Prevalence of TTI in blood donors visiting Regional Blood Centre D.I.Khan (n=3329)

Variable	Attributes	Sample Statistics		95% CI for Proportion	
		Count	Percentage	Lower	Upper
Type of TTI	HBV	72	41.37%	40.66%	42.08%
	HCV	29	16.67%	15.96%	17.38%%
	HIV	9	5.172%	4.462%	5.882%
	Syphilis	62	35.63%	34.92%	36.34%
	Malaria	2	1.144%	0.439%	1.859%
	Total	174	100%		

Table-II. Prevalence of TTI by Type in total TTIs positive cases in sample (n=174)

Gender of Donors	TTIs distribution by gender		
	Yes	No	Total
Male	174	3089	3263
Female	0	66	66
Total	174	3155	3329

Table-III. Prevalence of TTIs by Gender in blood donors

With a chi-square goodness of fit value of 6.371 and p value 0.011, our observed values were statistically significantly lower from expected values.

Observed vs expected prevalence of HIV

Our adjusted expected counts for HIV were 8 out of total TTIs positive 153 cases for a sample of 3329. Our observed counts for presence of HIV were 9 out of total TTIs positive 174 cases from a sample of 3329. Values of Saba N are adjusted to make these comparable.¹⁶

With a chi-square goodness of fit value of 0.125 and p value 0.72, our observed values were not statistically significantly different from expected values.

Observed vs expected prevalence of Syphilis

Our adjusted expected counts for Syphilis were 30 out of total TTIs positive 153 cases for a sample of 3329. Our observed counts for presence of Syphilis were 62 out of total TTIs positive 174 cases from a sample of 3329.

With a chi-square goodness of fit value of 34.44 and p value 0.00001, our observed values were statistically significantly different from expected values.

Observed vs expected prevalence of Malaria

Our adjusted expected counts for Malaria were 4 out of total TTIs positive 153 cases for a sample of 3329. Our observed counts for presence of Malaria were 2 out of total TTIs positive 174 cases from a sample of 3329. With a chi-square goodness of fit value of 1.001 and p value 0.317, our observed values were not statistically significantly different from expected values.

DISCUSSION

Modern medicine uses blood transfusions to save lives but it plays a critical part in the spread of blood-borne illnesses. The prevalence of TTIs in healthy populations can be estimated through strict blood screening, which also helps to guarantee that the patients receive a safe supply of blood and blood products. According to estimates, there is a 1 percent chance that TTIs

will be transmitted after every blood transfusion. Consequently, TTIs pose a challenge to blood transfusion systems around the world and necessitate specific preventative measures.

Pakistan, too, is having significant issues with the safety and accessibility of blood.

In our study, we calculated that 5.22 % of blood donors had TTIs overall. This prevalence is not statistically significantly different from one by Saba N in Peshawar, Pakistan, which found a seroprevalence of 4.6%.¹⁶ It is also comparable to another study carried out in Karachi, Pakistan, where the estimated frequency was 5.8%.¹⁸ When compared internationally with some other countries like one of the studies carried out in India by Mandal S et al, the total prevalence was only 1.92% which shows much lower prevalence of TTIs.¹⁹ In another Indian study it was 1.12%.¹³ While studies from Bangladesh also shows a lower prevalence of 2.22%.²⁰ On the other hand, study carried out in China shows a prevalence of 15.35% much higher than our study²¹, and study from USA shows a prevalence of 27.9 % per 100,000 from 9.4 million donors.²²

Male donors account for the majority in our sample, accounting for 98.2% (3263/3329) of the positive TTIs cases, compared to female donors, who account for only 1.98% (66/3329). This demonstrates that even though women make up over 50% of the population, they donate less blood. This may be the result of their general lack of awareness, motivation, and guidance. This same pattern was observed in study by Saba N et al, which only had 0.78 % female donors.¹⁶ Study from India and Bangladesh accounts for 99.23%, 90.6% male donors and 0.76%, 9.4% female donors respectively.^{19,20}

In our D.I. Khan region, acute and chronic hepatitis are one of the most often reported health issues. Our study indicated a significant difference in the prevalence of several TTIs, with HBV 2.16 % in blood donors exhibiting a greater overall frequency than HCV 0.87 %, HIV 0.27 %, Syphilis 1.86 %, and malaria 0.06%. This finding would suggest that HBV is widely prevalent in

the population. Our HBV prevalence is higher than the 1.95 % seen in the Peshawar study.¹⁶ Studies from India¹⁹ and Bangladesh²⁰ show lower hepatitis B prevalence 0.42% and 1.20% respectively as compared to our study. On the other hand, study from China shows a much higher prevalence of 10.98% despite the fact that China is among one of the most developed countries.²¹ Syphilis, HCV, HIV, and malaria follow HBV in prevalence in this order. In our study, the prevalence of syphilis is 1.86%, which is higher than the prevalence in Peshawar, which was only 0.9%.¹⁶ Study from India reports no case of Syphilis while study from Bangladesh shows a prevalence of 0.34%. Although the prevalence of HCV .87% is less than the Peshawar study's prevalence of 1.38 %.¹⁶ But studies from India and Bangladesh show lower Hepatitis C prevalence of 0.56% and 0.68% respectively.^{19,20} The overall prevalence of HIV is 0.27%, which is rather comparable to the 0.23 % found in the Peshawar study.¹⁶ Study from India indicates HIV prevalence of 0.13%¹⁹ and Bangladesh study reports no case of HIV.²⁰ In our study, there was a 0.06% malaria prevalence compared to a 0.14 % prevalence in the Peshawar study.¹⁶ Study from India shows Malaria prevalence of 0.01%¹⁹ while Bangladesh reports no case of malaria.²⁰

Limitation of study is, being a cross sectional study, we could not explore factors responsible for higher prevalence of TTIs in our country as compared to some of our neighboring countries and higher prevalence of syphilis in D.I. Khan as compared to expected prevalence.

CONCLUSION

By analyzing our sample, it was found overall TTIs prevalence of 5.2% was not statistically significantly different from expected prevalence 4.6% of TTIs but syphilis prevalence was higher than expected.






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REFERENCES

1. Fessehaye N, Naik D, Fessehaye T. **Transfusion transmitted infections–A retrospective analysis from the National Blood Transfusion Service in Eritrea.** Pan Afr. Med. J. 2011; 9(1):1-0.
2. World Health Organization. **Blood safety and availability fact sheet.** 2020.1(1): Available from: URL: <https://www.who.int/newsroom/fact-sheets/detail/blood-safety-and-availability>
3. Tagny CT, Owusu Ofori S, Mbanya D, Deneys V. **The blood donor in sub-Saharan Africa: A review.** Transfusion Medicine. 2010; 4:1-10.
4. World Health Organization (WHO) Hepatitis B. **Fact sheet Number 204.** 2013. Available from: URL: <http://www.who.int/mediacentre/factsheets/fs204/en/>
5. Ishfaq K, Naeem SB, Ali J. **Socio-economic factors of thalassemia major on Patients' families: A case study of the Children's hospital and the institute of child health Multan, Pakistan.** Int J Med Appl Health. 2013; 1(1):37-41.
6. Ahmad M, Saeed M, Hanif A, Waheed U, Arshad M, Ain NU. **Slump of trends in transfusion-transmissible infectious diseases: Is syphilis alarming in Pakistan?.** Glob. J. Transfus. Med. 2019; 4(1):45-51.
7. Waheed U, Abdella YE, e Saba N, Arshad M, Wazeer A, Farooq A. **Evaluation of screening effectiveness of hepatitis B surface antigen and anti-HCV rapid test kits in Pakistan.** J. Lab. Physicians. 2019; 11(04):369-72.
8. Waheed U, Ahmed S, e Saba N, Wazeer A. **Haemovigilance as a quality indicator in transfusion medicine: Pakistan's perspective.** Annals of PIMS-SZABMU. 2020; 16(1):46-51.
9. Zaheer HA, Waheed U, Tahir S, Nasir K. **National blood banks data collection report.** Safe Blood Transfusion Programme, Government of Pakistan. 1(1): Available from: URL: <https://www.sbtpr.gov.pk/wp-content/uploads/2019/10/National-Data-CollectionReport-2018>.
10. Butt AS, Sharif F. **Viral hepatitis in Pakistan: Past, present, and future.** Eurasian. J. hepatogastroenterol 2016; 6(1):70-81.
11. **Global hepatitis report 2017.** Available from: URL: <https://www.who.int/publications-detail-redirect/9789241565455>
12. Nagalo MB, Sanou M, Bisseye C, Kaboré MI, Nebie YK, Kienou K. **Seroprevalence of human immunodeficiency virus, hepatitis B and C viruses and syphilis among blood donors in Koudougou (Burkina Faso) in 2009.** Blood transfusion. 2011; 9(4):419-24.

13. Sundaramoorthy R, Arunagiri R, Ganesan V, Perumal S, Tiruvanmalai R, Charles J. **Seroprevalence of transfusion transmissible infections among blood donors by chemiluminescent assay in a tertiary care centre.** J Infect Dev Ctries 2018; 12(01):031-6.
14. Centers for Disease Control and Prevention. **National center for injury prevention and control. Web-based Injury Statistics Query and Reporting System (WISQARS).** [Online] [cited at 2022 April 21]; Available from: URL: www.cdc.gov/injury
15. Waheed U, Hayat K, Ahmad B, Waheed Y, Zaheer HA. **Evaluation of HIV/AIDS diagnostics kits and formulation of a testing strategy for Pakistan.** J Clin Virol 2013; 56(4):367-9.
16. Saba N, Nasir JA, Waheed U, Aslam S, Mohammad I, Wazeer A. **Seroprevalence of transfusion-transmitted infections among voluntary and replacement blood donors at the Peshawar Regional Blood Centre, Khyber Pakhtunkhwa, Pakistan.** J. Lab. Physicians. 2021; 13:162-168.
17. Mandal S, Kumar R, Parwan D, Singh N, Sharma R, Das B. **Seroprevalence of transfusion transmissible infections among blood donors and their notification: A study from North India.** Iraqi J Hematol 2022; 11: 65-9.
18. Arshad A, Borhany M, Anwar N, Naseer L, Ansari R , Boota S et al. **Prevalence of transfusion transmissible infection in blood donors of Pakistan.** BMC Haematol 2016; 16: 1-6.
19. Sundaramoorthy R, Arunagri R, Ganesan V, Perumal S, Tiruvanmalai R, Charles J. **Seroprevalence of Transfusion Transmissible Infections among blood donors by chemiluminiscent assay in a tertiary care centre.** J Infect Dev Ctries; 2018; 12(1):031-036.
20. Ara F, Nasreen Z, Islam MA, Yusaf MA, Hassan MS, Sonia SF. **Frequency of Transfusion Transmitted Infections among blood donors at specialized tertiary care hospital in Bangladesh.** J Nati Inst of Neurosci Bangladesh 2015; 12: 12-4.
21. Cao WW, Zhou RR, Ou X, Shi LX, Tan H, Li N, Li BJ et al. **Prevalence of Hepatitis B virus, Hepatitis C virus, Human Immunodeficiency Virus and treponema pallidum infections in hospitalized patients before transfusion in Xiangya Hospital Central South University China from 2011 to 2016.** BMC Infectious Diseases 2018; 18: 1-7.
22. Steele WR, Dodd RY, Xu M, Notari EP, Nelson D, Reik R et al. **Prevalence of Human Immunodeficiency Virus, hepatitis B virus and Hepatitis C virus in United States blood donations, 2015 -2019: Transfusion transmissible Infections Monitoring System (TTIMS).** Transfusion 2020; 60: 2327-39.

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