

Original Research Article**Screening of Blood Donors for Transfusion Transmitted Infections: Is Zero Risk Blood Supply Possible?****Smita C. Pathade¹, Anagha P. Amale², Harshada R. Bhangale³, Runali D. Mendhe⁴, Vilas M. Sangole⁵**¹Associate Professor ²Associate Professor ^{3,4}Post Graduate Student ⁵Professor and HOD, Department of Pathology, Dr. Ulhas Patil Medical College and Hospital, Jalgaon, Maharashtra 425001, India.**Abstract**

Context: Blood transfusion service is a vital part of the National health service and there is no substitute for human blood and its components. Main objective of National blood policy is to provide safe, adequate quantity of blood, blood components and products. However window period blood donation may not be picked up by the routinely employed screening methods and may carry the risk of transfusing transfusion transmitted infections (TTI).

Aims: Aim of the present study is to find the seroprevalence of transfusion transmitted diseases (viz. HIV, HBV, HCV infection, syphilis and malaria) in blood donors.

Methods and Material: Present study is a retrospective study carried out in hospital attached blood bank of Medical college in rural area of Maharashtra. All blood donations received during a period of seven years i.e from January 2010 to December 2016 were included in the study. Results of screening tests performed for HIV, HBV, HCV infection, syphilis and malaria were noted. Data obtained was tabulated and seroprevalence of individual infection derived.

Results: The seroprevalence of transfusion transmitted infections in blood donors in present study is 1.46% with seroprevalence of 0.20% for HIV, 1.11% for HBV, 0.12% for HCV infection and 0.02% for syphilis.

Conclusions: Seroprevalence of TTIs among blood donors has a decreasing trend. However the risk of transmitting infection through blood transfusion even though negligible still persists.

Keywords: Blood Donors; Seroprevalence; Transfusion Transmitted Infections.

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(Received on 25.04.2018,

Accepted on 14.05.2018)

Introduction

Blood is vital and is the most essential lifesaving substance. It cannot be produced artificially. Thus the only source to obtain blood for the purpose of blood transfusion is from human beings. The major aim of blood transfusion is to make transfusion safe and beneficial. With continuous research and development in the field of blood banking the risk of transmission of transfusion transmitted infections (TTI) is decreasing day by day. By advocating and assisting in the

development of policies, infrastructures and training of personnel, WHO is working along with National authorities to promote safe blood and to reduce the spread of HIV and other TTI in all countries [1]. Even after all the ongoing efforts and technological advances zero risk blood supply appears to be a dream.

How far we are away from completely safe blood supply? As an attempt to answer this question, we conducted a retrospective study which involved collecting data from our hospital attached blood bank.

Material and Methods

Total number of blood donations received and the number of sero-reactive blood bags were noted from January 2010 to December 2016. This included unpaid voluntary donors as well as replacement donors. Demographic details about the donors were not included in the study as main aim of the study was to know the seroprevalence of TTI in donor group.

Our blood bank follows the rules and regulations laid down by National blood policy. Strict donor selection criteria's are adhered to by highly competent medical officers. Screening of donated blood is done for common TTIs like HIV, HBV, HCV, syphilis and malaria by experienced and highly competent technicians and pathologists.

Screening for HIV infection is done using Qualisa™ microwell enzyme immunoassay HIV4.0 kit. This kit is intended to be used for the detection of antibodies to HIV 1/2 and "O" subtype virus and HIV-1 p24 antigen in human serum or plasma.

Screening for HBV infection is done using Qualisa™ microwell enzyme immunoassay HBsAg kit. This kit is intended to be used for the detection of hepatitis B surface antigen (HBsAg) in human serum or plasma.

Similarly for HCV infection, Qualisa™ microwell enzyme immunoassay HCV kit was employed. This is a third generation enzyme immunoassay and is intended to be used for the detection of antibodies to hepatitis C virus in human serum or plasma.

Screening of syphilis was done using rapid plasma reagin test. For detection of malaria, peripheral blood smears (PBS) were prepared and reported by pathologist.

Statistical Analysis

The data obtained was tabulated. Seropositive cases were distributed year wise and overall percentage of seropositivity was derived. Seroprevalence of HIV, HBV, HCV infection and syphilis was derived.

Observation / Results

Total number of donors screened during the period of 7 years from January 2010 to December 2016 was 14,227. Total 209 donors tested seropositive for one of the TTI viz. HIV, HBV, HCV and syphilis. All PBS samples screened were negative for malarial parasite. We came across 3 co-infections, of which 2 case were seroreactive for HBV and HCV and one case was seroreactive for HCV and syphilis.

Out of total 209 seroreactive donor blood bags, 159 tested positive for HBV, 29 for HIV, 18 for HCV and 3 were found positive for syphilis giving seroprevalence of 1.11%, 0.20%, 0.12% and 0.02 % respectively (Table 1).

Overall seropositivity is highest for HBV infection, followed by that for HIV infection. Maximum numbers of HBV seropositive cases were detected in year 2012. Similarly for HCV infection as well maximum seropositivity was detected in the same year i.e. 2012. Reason for which cannot be explained. A fluctuating trend is seen for HIV seropositivity over the years.

Discussion

NACO in 2016 preliminary report mentioned the National seropositivity of TTIs among blood donors as 0.13%, 0.93%, 0.3%, 0.18% and 0.03% for HIV, HBV, HCV, syphilis and malaria respectively [2]. In present study, the seroprevalence of HIV, HBV, HCV, syphilis and malaria is found to be 0.20%, 1.11%, 0.12%, 0.02% and 0.00% respectively. Our data correlates well with National statistics.

Multiple studies related to seroprevalence of TTIs among blood donors are reported from various parts of India [3-13]. Similar studies are reported from other parts of the world as well [14- 16]. Table 2 shows the results of studies carried out in India, Pakistan, New Ethiopia and Tanzania.

Table 3 shows the seroprevalence studies carried out in India between year 1990 and 2000. During this time period mean seroprevalence of HIV, HBV, HCV infection and syphilis is 0.36%, 6.2%, 0.9% and 0.67% respectively.

Table 1: Year wise distribution of seropositivity for TTIs in blood donors

Sr. No.	year	Number of donors	Test results				
			HIV	HBsAg	HCV	Syphilis	Malaria
1	2010	784	5	9	1	0	0
2	2011	2000	7	28	4	1	0
3	2012	3077	5	46	6	0	0
4	2013	2650	4	27	0	1	0
5	2014	2076	2	23	4	0	0
6	2015	2002	1	11	2	1	0
7	2016	1638	5	15	1	0	0
	Total	14,227	29 (0.20%)	159 (1.11%)	18 (0.12%)	3 (0.02%)	0

Table 4 shows the seroprevalence studies carried out in India between year 2001 and 2016. During this time period mean seroprevalence of HIV, HBV, HCV infection and syphilis is 0.23%, 1.20%, 0.40% and 0.23% respectively. Thus we can infer that the seroprevalence of TTIs among blood donors has a decreasing trend in different parts of India

In present study, seroprevalence of HBV is high as compared to that of other TTIs. Similar finding is reflected in all other studies listed in table 2 [3-16]. As blood donors are part of general population, we can suggest

that measures to control the incidence of HBV should be intensified.

One of the limitations of our study is that we could not recheck the results of screening test by confirmatory test due to lack of facilities in our blood bank. Individual Donor Nucleic Acid Testing (ID-NAT) is the latest technological advance in ensuring the safety of the nation's blood supply. ID-NAT is a direct test which targets the viral DNA/RNA. Multiple studies conducted in India to evaluate the benefits of NAT in blood banks have concluded with favorable results [7, 17].

Table 2: Results of studies carried out in India and abroad

Sr. No.	Study group / State	Year of study	Seroprevalence				Malaria
			HIV	HBV	HCV	Syphilis	
Indian studies							
1	Patil et al ³ , Karnataka	2011- 2012	0.42%	1.88%	0.28%		
2	Srikrishna et al ⁴ Bangalore	1997- 1998	0.44%	1.86%	1.02%	1.6%	
3	Fernandes et al ⁵ Karnataka	2008- 2009	0.06%	0.34%	0.06%	0.11%	0.01%
4	Mathaiet al ⁶ Kerala	1994- 1999	0.2%	13.3%	1.4%	0.2%	
5	Prasad et al ⁷ Bangalore	2006- 2011	0.23%	0.53%	0.05%	0.05%	
6	Garg et al ⁸ Jodhpur Rajasthan	1994- 1999	0.44%	3.44%	0.28%	0.22%	
7	Jain et al ⁹ Jaipur	2009- 2010	0.33%	1.5%	0.63%	0.16%	
8	Arora et al ¹⁰ South Haryana	2002- 2006	0.3%	1.7%	1.0%	0.9%	
9	Chaurasiaet al ¹¹ New Delhi	2011- 2013	0.27%	1.38%	0.54%	0.32%	
10	Giri et al ¹² , Pravara	2009- 2010	0.07%	1.09%	0.74%	0.07%	
11	Chandekar et al ¹³ , Mumbai	2007- 2011	0.26%	1.30%	0.25%	0.28%	
12	Present study	2010- 2016	0.20%	1.11%	0.12%	0.02%	0.00%
Studies carried out of India							
13	Arshad et al ¹⁴ , Pakistan	Before 2016	0.04%	1.84%	1.7%	2.1%	0.07%
14	Tessema et al ¹⁵ , New Ethiopia	2003- 2007	3.8%	4.7%	0.7%	1.3%	
15	Matee et al ¹⁶ , Tanzania	2004- 2005	3.8%	8.8%	1.5%	4.7%	

Table 3: Results of seroprevalence studies carried out in India between year 1990 and 2000

Sr. No.	Study group/ State	Year	Seroprevalence			
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2	Mathaiet al 6, Kerala	1994-1999	0.2%	13.3%	1.4%	0.2%
3	Garg et al 8, Jodhpur Rajasthan	1994- 1999	0.44%	3.44%	0.28%	0.22%
	Mean Seroprevalence		0.36%	6.2%	0.9%	0.67%

Table 4: Results of seroprevalence studies carried out in India between year 2001 and 2016

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			HIV	HBV	HCV	Syphilis
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2	Fernandes et al ⁵ Karnataka	2008- 2009	0.06%	0.34%	0.06%	0.11%
3	Prasad et al ⁷ Bangalore	2006- 2011	0.23%	0.53%	0.05%	0.05%
4	Jain et al ⁹ Jaipur	2009- 2010	0.33%	1.5%	0.63%	0.16%
5	Arora et al ¹⁰ South Haryana	2002- 2006	0.3%	1.7%	1.0%	0.9%
6	Chaurasiaet al ¹¹ New Delhi	2011- 2013	0.27%	1.38%	0.54%	0.32%
7	Giri et al ¹² , Pravara	2009- 2010	0.07%	1.09%	0.74%	0.07%
8	Chandekar et al ¹³ , Mumbai	2007- 2011	0.26%	1.30%	0.25%	0.28%
9	Present study	2010- 2016	0.20%	1.11%	0.12%	0.02%
	Mean Seroprevalence		0.23%	1.20%	0.40%	0.23%

Conclusion

The seroprevalence of TTIs in blood donors in present study is 1.46%, with 0.20% for HIV, 1.11% for HBV, 0.12% for HCV and 0.02% for syphilis. Measures to reduce the incidence of HBV infection in general population should be intensified so as to reduce the incidence of HBV infection in blood donors. If individual donor Nucleic acid testing (ID – NAT) is performed for TTIs, on blood donor samples, we can come more close to zero risk blood transfusion.

Acknowledgement

We would like to express our gratitude towards the expert technical assistance provided by Mr. Amol Chaudhari (Technical Supervisor), Mr. Sayyed Shaikh Sir (Senior Technician) and Mr. Ritesh Warke (Technician) working at hospital attached blood bank of DUPMC, Jalgaon.

References

1. Choudhry M, Choudhry VP. Prevention and control of HIV among blood products and IV drug users. In: Choudhry VP, Saxena R, Pati HP, editors. Recent advances in haematology. 1sted. New Delhi: Jaypee Brothers Medical Publishers(P) Ltd; 2004.pp.165–82.
2. National AIDS Control Organization (NACO) and National Blood Transfusion Council (NBTC), Ministry of health and family welfare, Government of India in collaboration with U.S centers for disease control and prevention (HHS/ CDC) division of global HIV and TB (DGHT), India, Christian medical college, Vellore & Christian medical association of India (CMAI), New Delhi. Assessment of NACO supported blood banks. A preliminary report 2016.
3. Patil VS, Patil PM. Seroprevalence of transfusion transmissible infections among blood donors, A retrospective study. *Indian journal of pathology research and practice*. 2017;6(2):303-6.
4. Srikrishna A, Sitalakshmi S, Damodar P. How safe are our safe donors? *Indian J pathol microbial*. 1999;42(4):411-16.
5. Fernandes H, D'souza PF, D'souza PM. Prevalence of transfusion transmitted infections in voluntary and replacement donors. *Indian J Hematol Blood Transfus*. 2010Sept;26(3):89-91. doi:10.1007/s12288-010-0044-0.
6. Mathai J, Sulochana PV, Satyabhama S, Nair PK, Sivakumar S. Profile of transfusion transmissible infections and associated risk factors among blood donors of Kerala. *Indian J PatholMicrobiol*. 2002 July;45(3):319-22.
7. Prasad S, Uma Bai KR. Seropositivity of HIV, Hepatitis B and C, and syphilis among blood donors: A retrospective study. *Asian journal of transfusion science*. 2014 June;8(1):66–67. doi:10.4103/0973-6247.126705.
8. Garg S, Mathur DR, Garg DK. Comparison of seropositivity of HIV, HBV, HCV and syphilis in replacement and voluntary blood donors in western India. *Indian J PatholMicrobiol*. 2001 Oct;44(4):409–12.
9. Jain R, Aggarwal P, Gupta GN. Need for nucleic acid testing in countries with high prevalence of transfusion transmitted infections. *ISRN Hematology*. 2012 August. DOI:10.5402/2012/718671. <https://www.researchgate.net/publication/231176761>.
10. Arora D, Arora B, Khetarpal A. Seroprevalence of HIV, HBV, HCV and syphilis in blood donors in southern Haryana. *Indian J PatholMicrobiol*. 2010 June;53(2):308-9.
11. Chaurasia R, Aman 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. *Journal of blood transfusion*. 2014 Nov; <http://dx.doi.org/10.1155/2014/412105>.
12. Giri PA, Deshpande JD, Phalke DB, Karle LB. Seroprevalence of transfusion transmissible infections among voluntary blood donors at a tertiary care teaching hospital in rural area of India. *J Family Med Prim Care*. 2012 June;1(1):48-51.
13. 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 Physicians*. 2017 Dec;9(4):283-287.
14. 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. doi:10.1186/s12878-016-0068-2.
15. Tessema B, Yismaw G, Kassu A, Amsalu A, Mulu A, Emmrich F et al. Seroprevalence of HIV, HBV, HCV and syphilis infections among blood donors at Gondar University teaching hospital, Northwest Ethiopia: declining trends over a period of five years. *BMC infect Dis*. 2010;10:111.
16. Matee MI, Magesa PM, Lyamuya EF. Seroprevalence of human immunodeficiency virus, hepatitis B and C viruses and syphilis among blood donors at the Muhimbil National hospital in Dar Es Salaam, Tanzania. *BMC public health*. 2006;6:21.
17. Shrivastava M, Mishra S. Nucleic acid amplification testing (NAT): An innovative diagnostic approach for enhancing blood safety. *National journal of laboratory medicine*. 2017 Apr;6(2): IRO1 – IRO6. DOI: 10.7860/NJLM/2017/26201:2205.