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Prevalence of Transfusion Transmitted Infection among Blood Donors in Tertiary Care Hospital

Yogesh Kumar[1], Monika Garg[2], Sushant Kumar Meinia[3]

MMIMS & R, MULLANA, AMBALA (INDIA)

Abstract: **Transfusion-transmitted infections [Human immune deficiency virus (HIV), Hepatitis B virus (HBV), Hepatitis C virus (HCV), syphilis and malaria] acquired through the therapeutic blood transfusion process is a most important universal health problem in transfusion medicine. WHO, FDA and Indian government have selected mandatory testing criteria for each unit of blood in India. *Design:* Study was carried out over a period of 5 year i.e. 2009 to 2013. The conducted study was prospective and retrospective. The testing protocol was followed in the blood bank, after complete physical examination of blood donor by blood bank medical officer. *Results:* Over a five year period total blood donation was 10641, in which 9679 (90.39%) were replacement and remaining 962 (9.61%) were voluntary. There was a rise in number of voluntary donor over the five year period. The prevalence of HIV, HBsAg, HCV, Syphilis and Malaria was 11 (0.10%), 92 (0.86%), 129 (1.21%), 26 (0.24%) and 11 (0.10%) respectively. The seropositivity of HCV showed increasing trend from 2009 to 2013. The decreasing trends of prevalence were seen in HIV, Syphilis and Malaria. *Conclusion:* These findings propose that pre-donation counseling and donor self-exclusion will be effective in decreasing the TTI's as well as practices of autologus blood transfusion should be encouraged. Nucleic acid amplification testing (NAT) must be implemented that identify blood donation made during the immunological window period before seroconversion.**

Keywords: **HIV-Human Immunodeficiency Virus, HBSAg-Hepatitis B Surface Antigen, HCV-Hepatitis C Virus, VDRL-Vineral Disease research Laboratory, WHO-World Health Organization.**

1. INTRODUCTION

Over a million blood units are collected from donor every year. Globally more than 81 million units of blood are donated each year. In blood transfusion risk of infection like HIV (Human Immunodeficiency Virus) Hepatitis B and C, Syphilis and Malaria and infrequently toxoplasmosis, brucellosis and viral infection like CMV, Epstein Barr Virus and Herpes Virus.

Human immunodeficiency virus, the causative agent of Acquired Immunodeficiency Syndrome (AIDS) is found in pandemic proportions. HIV accounted for 38.6 million infections worldwide at the end of 2005.[2] Transmission of HIV and other blood-borne infections can occur during transfusion of blood components (i.e. whole blood, packed red cells, fresh-frozen plasma, cryoprecipitate, and platelets) derived from the blood of an infected individual.[3]

In 1965, Blumberg, observed a new antigen which gave named Australian antigen. It was subsequently shown to be the surface component of HBV. Therefore, the name Australian antigen was changed to hepatitis B surface antigen (HBsAg).[4] the prevalence of chronic HBV infection in India ranges from 2% to 10%. India therefore comes under the intermediate to high endemicity category.[5]

Hepatitis C was first time described in 1989 in human beings. Ever since its discovery it became clear that this virus was the major cause of acute hepatitis after a blood transfusion that was neither related to hepatitis A nor to hepatitis B (hence the early name for this disease, non-A, non-B hepatitis). It has been estimated that the global prevalence of Hepatitis C

virus (HCV) infection is around 2%, with 170 million persons chronically infected with the virus and 3 to 4 million persons newly infected each year.[6]

VDRL reactivity varies from 0.8% in voluntary donors to more than 15% in paid commercial donors. Only fresh blood and its components may transmit syphilis. In syphilis the stored blood is not discarded, after 72 hours at 4ºC, the germs becomes ineffective.[7] Syphilis may be co-infected with HIV, HBV and HCV. Transmission of malaria can occurs after transfusion of whole blood, red cell or any blood component contaminated with red cells.[8]

Most government hospital and private hospital blood bank in India prefer ELISA kits, which can not detect HIV before 22 days, HBV before 59 days and HCV before 82 days of infection. Each unit of blood must be screened for the serologic testing of HIV, HBV, HCV, syphilis and for the presence of malarial parasite.

Method and Materials: The prospective and retrospective 5 year study (i.e. 2009 to 2013) was undertaken to determine the prevalence of transfusion transmitted infection among blood donors in the Blood Bank of Department of Pathology in M.M. Institute of Medical Sciences & Research, Mullana, Ambala.

Inclusion criteria: Physically fit blood donors aged between 18 to 65 years.

Exclusion criteria: Exclusion criteria followed in blood donors who had previous history of HIV, HBV, and HCV infection. If the donor below 18 years weighted less than 45kg, having anemia and history of jaundice within past six months, high risk behavior of drug use, unsafe intercourse and donated blood within past three months were also excluded.

Diagnostic setting: 3rd generation Microlisa was used to detect the HIV Antigen and Antibody in donor serum. 4th generation Hepalisa was used for detection of Hepatitis B Surface Antigen and 4th generation HCV Microlisa was used for detection of HCV Antibody in serum or plasma of donor. The Sero-Max RPR (slide agglutination method) was used for VDRL screening. The malarial parasite was detected by Advantage Pan Malaria Card.

2. RESULTS

We evaluated a total of 10641 units of blood during 1st January 2009 to 31st December 2013. The results were interpreted and following details were drawn in tables.

Table I: Blood Collection During Study Period

Study Years	Unit Collection
2009	1212
2010	1531
2011	2324
2012	2636
2013	2928
Total Collection	**10,641**

Table showing the year wise collection of blood units, year 2009 show the lowest collection (1212), and the highest collection was found in 2013 (2928). Result also shows increased blood collection in every year.

Table II: Distribution Of Voluntary And Replacement Donor

Year	Voluntary	% of Voluntary	Replacement	% of Replacement
2009	165	13.60%	1047	86.40%
2010	155	10.12%	1376	89.87%
2011	180	7.75%	2144	92.25%
2012	216	8.21%	2420	91.79%
2013	246	8.40%	2682	91.60%
Total	962	9.61%	9679	**90.39%**

Out of 10641 blood donation, 9679 (90.39%) were replacement and 962 (9.61%) were volunteer. The highest volunteer donation trend seen in 1st year of study 165 (13.60%), this trends continuously decreased from 2009 to 2011. After this period, number of volunteer donor slightly increased per year and trend reached 7.75% (2011) to 8.40% (2013) in the last years of study. The number of voluntary donor increased every year but the trends shows constant in over five year study.

Table III: TTI Positive Donor In Voluntary And Replacement Donation

Years	Vol/Rep	Total	Total % of Vol/Rep
2009	06/18	24	2.5% / 6.7 %
2010	02/09	11	0.7 % / 3.3 %
2011	05/79	84	1.8 % / 28.9 %
2012	05/61	66	1.8 % / 22.2 %
2013	04/80	84	1.5 % / 28.9 %
Total	**22/247**	**269**	**8.3 % / 91.7 %**

Result shows the 247 (91.7%) replacement and 22 (8.3%) voluntary blood donors. And we found that the trends of replacement blood donors are more susceptible for infection than the volunteer.

Table IV: Distribution Of Seropositivity

Infections	2009	2010	2011	2012	2013	Total
HIV	01 (0.08%)	01 (0.06%)	05 (0.21%)	01 (0.03%)	03 (0.10%)	11 (0.10%)
HBV	07 (0.57%)	04 (0.26%)	29 (1.21%)	22 (0.84%)	30 1.02%)	92 (0.86%)
HCV	11 (0.90%)	03 (0.19%)	35 (1.50%)	38 (1.44)	42 (1.43%)	129 (1.21%)
Malaria	02 (0.16%)	0 (0%)	06 (0.25%)	01 (0.03%)	02 0.06%)	11 (0.10%)
Syphilis	03 (0.245)	03 (0.19%)	09 (0.38%)	04 (0.15%)	07 0.23%)	26 (0.24%)
Total	24 (1.9%)	11 (0.71%)	84 (3.61%)	66 (2.50%)	84 (2.86%)	269 (2.52%)

Seropositivity distribution shows the high prevalence in year 2011 (3.61%), 1012(2.50%) and 2013 (2.86%). And the particular trend of HCV 129 (1.21%) donors was much higher in this region.

Table V: Co-Infected TTI'S

Year	HBV-HCV	HBV-SYPHILIS	HIV-SYPHILIS	HIV-HCV	TOTAL
2009	00	00	00	00	00
2010	00	00	00	00	00
2011	01	01	02	00	04
2012	02	00	00	01	03
2013	01	01	00	00	02
TOTAL	04	02	02	01	**09**

Our results show the co-infection between HBV-HCV (4) is higher than the other co-infection like as HBV-Syphilis (2) and HIV-Syphilis (2), HIV-HCV was only one. Total co-infected TTI's during five year study was 09. In first two year of study there was no co-infected donor seen.

Table VI: Distribution Of Blood Group Positivity Of TTI Positive Donors

Year	A	B	AB	O	+ve	-ve
2009	03	11	01	09	21	03
2010	02	04	04	01	10	01
2011	16	31	04	33	79	05
2012	23	18	04	21	62	04
2013	15	39	10	20	83	01
Total	59	103	23	84	245	14

Table shows highest transfusion transmitted infection positivity (103) in 'B' positive blood group and lowest (23) in 'AB' donors. These results are predominantly similar with prevalence of ABO in India.

3. DISCUSSION

In recent years there has been a special interest in donor selection strategies in blood banks in order to provide safe blood supply.

In our study 90.39% of the donors were replacement donor and remaining 9.61% were voluntary donor. In a similar study by Kakkar et al 94.7% of donors were replacement donors.[9] Makroo et al 94.2% of their donors were replacement donor[10] and 85.6% replacement donors in a study carried out by Chattoraj A et al,[11] whereas in Chandigarh 55% replacement donor in a study by Kaur G et al.[12] This probably reflects a basic lack of awareness in general population, the presence of misconception and fear of donating blood also the problem.

The trends of HIV sero-positivity is decreasing over the years. The prevalence of HIV reported in Indian blood donors ranges from 0.084% to 3.87%.[10] In our five year study, the prevalence of HIV was 0.10% (range 0.009% - 0.047%). The similar results showed 0.12% in 2003, 0.17% in 2004 and 0.10% in 2005 by Chattoraj et al.[11] Singh et al showed increased HIV seropositivity 0.54% in Delhi.[13] And similar results showed in previous study at Mullana resulted 0.09% HIV positivity by Garg M et al.[14] In South-African countries HIV prevalence are much greater than our results and other developing countries.

In HBV positivity, we find out decreased prevalence of HBV 0.86% than 1.0% in 2008 at Mullana by Garg M et al[14] and according to WHO classification the area qualify as a low prevalence area (< 1%). In Chandigarh and south Haryana prevalence of HBV was higher than the present study and in south-Indian region this positivity rate more higher noted (2.82%) by Rangroo et al in Maharashtra[15] and 2.27% in West Bengal by Sinha et al in voluntary donors.[16] The most widely used HBV marker, namely HBsAg is not usually detecting the window period of the infection. Our results came under low prevalence.

In our study the HCV prevalence is 1.21% (ranging 0.10% in 2009 to 0.39% in 2013) much higher than the past five year results (0.65%) by Garg M et al.[14] The other parts of India show the low prevalence except Punjab region (1.38%) by Kaur H et al.[17]

In five years of study, we found 0.24% syphilis positivity in blood donor these results are similar with 0.22% in Maharashtra by Rangroo et al.[15] And significantly decreased than 0.5% was resulted by Garg M et al in 2008 at Mullana, Haryana.[14] And also lower than 0.5% showed by Biswas et al in Rajasthan[18] and 0.7% by Kaur G et al from Chandigarh.[12]

In the contrast of South-African countries our results are much better but in the comparison of developed countries our results are so high, due to unimproved donor selection processes and fresh blood transfusion (without storage).

In this study we found 0.10% prevalence of Malaria where as zero percentage detected by Piyush A et al in Gujarat.[19] In foreign the malaria trends much high 61.66% in Nigeria by Okolie NJ et al.[20]

Transfusion transmits infection in Mullana in 2013 (2.52%) is so similar with Garg M et al 2.25% (2008) at Mullana,[14] Biswas et al in 2010 (2.26%) at Sri Ganganagar[18] and 3.8% in Chandigarh detected by Kaur G et al in 2005.[12] But our trends are much higher than 0.53% (2011) in Ahmedabad by Piyush et al.[19] In East India (Calcutta) Sinha SK et al resulted much more (5.8%) positivity in 2008 is higher[16] than our results (2.25%). In the comparison of previous study in Mullana, we found 0.27% more positivity.

Lower education level, being a labor/agriculture workers, residence in rural area, and history of blood transfusion, tattooing, intravenous drug use and sexual promiscuity were among the significant risk factors for transfusion transmitted infection in our donation. A particularly high prevalence of HCV and HBV infection has been found in uneducated blood donor population, indirectly indicating low socioeconomic condition. The increases in voluntary donors may be attributed to the increasing public awareness and involvement of government bodies like NACO (National AIDS Control Organisation) who actively propagate voluntary donation in our country.

4. CONCLUSION

Our study also suggests the development and testing of appropriate approaches for setting up a blood bank system based on voluntary blood donation. Pre-donation counseling and donor self-exclusion will be effective in decreasing the TTI's as well as practices of autologus blood transfusion should be encouraged. Certain control measures should be taken like immunization, the most effective and cost saving means of prevention, along with education.

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