Original Article

Seroprevalence And Trends In Transfusion Transmitted Infections Among Blood Donors

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ABSTRACT

Introduction: Timely transfusion of blood saves millions of lives, but unsafe transfusion practices put millions of people at risk of transfusion transmitted infections (TTIs).There are several infectious as well as non-infectious risks associated with transfusion of blood. With every unit of blood transfused, there is 1%chance of transfusion associated problems including transfusion transmitted infections. In India blood is screened for five diseases which could be transmitted through blood and produce serious illness- HIV, Hepatitis B, Hepatitis C, Syphilis and Malaria.

Aims and objectives : (1) To assess the trend of transfusion transmitted infections (TTIs)among blood donors from the records (2011-2013) at blood bank, GCSMCH, Ahmedabad, Gujarat. (2) To study the sero-prevalence of TTIs among blood donors from the records.

Methods: A record based study was conducted from June 2011- December 2013. Data were collected from the records of blood bank. Data regarding sex, screening test results and type of donors were collected from the records.

Results: Out of 2178 donors, voluntary donors were(4.17%) in comparison to replacement donors (95.83%). Amongst blood donors, prevalence of HBV (0.73%), HCV (0.09%), HIV (0.09%) and Syphilis (1.65%) were noted.

Conclusion: TTIs were more prevalent in replacement donors than voluntary donors. The number of voluntary donors has risen from 2011 -2013, but there is male preponderance in both voluntary and replacement donors than females.

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Introduction

Florence nightingale, more than 100 years ago said "no stronger condemnation of any hospital or ward could be pronounced than the single fact that zymotic (infectious) disease has originated in it, or that such a disease has attacked other patients than those brought in with them." It should be obligatory on those who are involved in transfusion of blood to a patient for saving his life, that the blood transfusion does no harm to the patient. [1]

Nothing could be worse than the fact that in an attempt to save life, blood & blood products having transmissible infectious agent have been given as morbidity and mortality resulting from it have far reaching consequences not only for the recipients themselves, but also for their families, communities & the wider society.[1]

Blood transfusion is the process of receiving blood products into one's circulation intravenously. There is a 1% chance of transfusion associated problems including transfusion transmitted diseases. Hence it is necessary to understand the organisms which could be transmitted through blood transfusion and means by which this could be prevented.[1, 2]

Globally, more than 81 million units of blood are donated each year. [3] More than 18 million units of blood are not screened for transfusion transmissible infections. [4] Meticulous pre-transfusion testing & screening particularly for transfusion transmissible infection (TTI) is the need of the hour.[1]

As per guidelines of the ministry of health and family welfare(government of India)under the Drug and Cosmetics Act, 1945 (amended from time to time),all the blood donations are to be screened against the five major infections namely HIV I and II,HBsAg,HCV, syphilis and malaria.[5, 6]

The first and most important step in ensuring the blood and its products for transfusion do not have any pathogenic organisms, is by the proper selection of blood donors. It should be done carefully. The donor should be in good health in order to avoid any untoward effect to the donor or the recipient. Blood collected from voluntary donors and relatives/friends of patients without any coercion on them is safe.[1]

Amongst the undesirable complications arising out of transfusion of blood and blood products,TTIs like HIV, hepatitis B and C, syphilis are most significant for long term detrimental side effects.[1]

The aim of the present study was to find out sero-prevalence of TTI in voluntary and replacement donors in our hospital transfusion service set-up. This study also aids in evaluating the safety of the collected donations.[2]

Aims and objectives:

1. To assess the trend of transfusion transmitted infections (TTIs) among blood donors from the records (2011-2013) at blood bank, GCSMCH, Ahmedabad, Gujarat.
2. To study the sero-prevalence of TTIs among blood donors from the records.

Materials and Methods

The present study was carried out in Gujarat Cancer Society Medical College, Hospital and Research Center, Ahmedabad, Gujarat, India. A total of 2178 blood donors were analyzed for prevalence of transfusion transmitted infections over a period of two and half years from Jun-2011 to Dec-2013 to determine the prevalence of HIV I & II, HBV, HCV, syphilis and malaria in order to provide information for relevant policies. These included replacement donors who donated for ailing patients and were family members, close relatives or friends of the recipient. The voluntary unpaid blood donors were obtained from walk-in donors, students and employees of the institutions .Care was taken to eliminate professional and paid donors by taking history and clinical examination.

Basic information regarding age, sex, occupation, number of previous donations was obtained. A five milliliter blood sample was collected from each healthy donor using plain blood collection tube, taken at the time of blood donation. The sample was kept at room temperature until fully clotted. Blood samples were spun at 2000 relative centrifugal force for 10 minutes at room temperature and serum was collected from them to perform infectious diseases screens.

Serological tests using enzyme linked immunosorbent assay (ELISA) technique were performed to screen blood donors for anti-HIV I & II, anti-HCV, HBsAg. All samples were screened for HBsAg (MONOLISA-BIORAD), anti-HIV I, II & anti-HCV (ELISA, MICROLISA, J.MITRA & CO). Anti-syphilis antibodies were detected by using indirect haemagglutination assay (TPHA-BIORAD).

For malaria detection, Romanowsky stained peripheral smear was examined by pathologist under oil immersion lens of microscope and reported as positive or negative for malaria. If positive, specified as P.Falciparum or P.Vivax species. Tests were performed according to manufacturer's instructions. Samples giving equivocal (gray zone) or preliminary reactive readings were confirmed by repeating the sample in duplicate using the same kit and testing it using another methodology. Repeatedly reactive samples were considered seropositive. All the kits used in screening process for all tests have a sensitivity and specificity greater than 99.8% according to manufacturer claim. Moreover, all preliminary reactive units for any of above transfusion

transmitted pathogens were discarded immediately prior to getting the confirmatory results.

Descriptive analysis was used for the prevalence rates. Only confirmed results were included in the study. The prevalencerate was calculated based on the numbers of donations tested and numbers of donations with positive results in confirmatory tests.

Results

A total of 2178 apparently healthy donors were screened over a period of two and half years from Jun-2011 to Dec-2013. Out of them, 91 (4.17%) were voluntary donors which included walk in donors at the blood bank of hospital. The remaining 2087 (95.83%) were replacement donors.(Fig: 1)

As per table 1, out of 2178 blood donors, maximum number of donors i.e. 1225 (56.24%) were between 18-30 years of age. In remaining donors, 654 (30.02%) were between 31-40 years of age. 260 (11.93%) donors were between 41-50 years of age and 39 (1.79%) donors belong to 51-60 years of age.

As per table 2, among 2178 blood donors, 91 (4.17%) were voluntary donors and 2087 (95.82%) were replacement donors. In voluntary blood donors, 86 (94.5%) were male and 5 (5.49%) were female donors. Same as in replacement blood donors, 2070 (99.18%) were male and 17 (0.81%) were female blood donors. This shows the pre-dominance of males compared to females in blood donation for the studied years.

As per table 3, sero-prevalence of HIV, HBV, HCV, Syphilis and Malaria was found to be 0%, 1.09%, 0%, 1.09%, 0% respectively in voluntary blood donors against the figures of 0.09%, 0.71%, 0.09%, 1.67%, 0% being the sero-prevalence of above mentioned infections in replacement donors. Total sero-prevalence of HIV, HBV, HCV, Syphilis and Malaria was 0.09%, 0.73%, 0.09%, 1.65%, 0% among 2178 blood donors during the study period. (Table 4)

Comparing our data, it seems it co-related with data from various studies carried out at various centers mentioned in table 5.

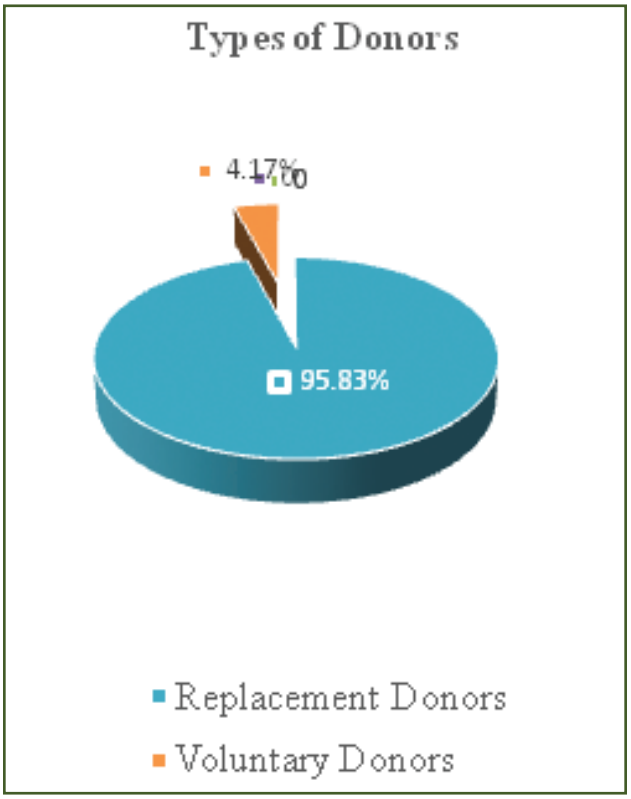

Fig. 1: Types of Donors

Table 1: Age Wise Brerak up of Blood Donors

Year	Total Number of Donors	Age Group (in Years)			
		18-30	31-40	41-50	51-60
2011	301	171 (56.81%)	80 (26.57%)	42 (13.95%)	8 (2.65%)
2012	865	496 (57.34%)	272 (31.44%)	86 (9.94%)	11 (1.27%)
2013	1012	558 (55.13%)	302 (29.84%)	132 (13.04%)	20 (1.97%)
Total	**2178**	**1225 (56.24%)**	**654 (30.02%)**	**260 (11.93%)**	**39 (1.79%)**

Table 2: Year and Gender Wise Break-up of Blood Donors

Year	Voluntary Donors				Replacement Donors				Total Blood Donors
	Male	Female	Total	%	Male	Female	Total	%	
2011	17	3	20	6.64	277	4	281	93.36	301
2012	32	1	33	3.82	824	8	832	96.18	865
2013	37	1	38	3.75	969	5	974	96.25	1012
Total	**86**	**5**	**91**	**–**	**2070**	**17**	**2087**	**–**	**2178**
%	94.50%	5.49%	4.17%		99.18%	0.81%	95.80%		

Table 3: Distribution of Seropositive Cases

YEAR : 2011			
INFECTIONS	VOLUNTARY DONORS	REPLACEMENT DONORS	TOTAL
	(Total No.20)	(Total No. 281)	(Total No. 301)
HIV	0	0	0
HBV	0	1 (0.35%)	1 (0.33%)
HCV	0	0	0
SYPHILIS	1 (5%)	9 (3.2%)	10 (3.33%)
MP*	0	0	0
TOTAL	**1 (5%)**	**10 (3.55%)**	**11 (3.66%)**

* Malarial Parasite

YEAR : 2012			
INFECTIONS	(Total No. 33)	(Total No. 832)	(Total No. 865)
HIV	0	0	0
HBV	0	5 (0.60%)	5 (0.57%)
HCV	0	2 (0.24%)	2 (0.23%)
SYPHILIS	0	8 (0.96%)	8 (0.92%)
MP*	0	0	0
TOTAL	**0 (0%)**	**15 (1.8%)**	**15 (1.73%)**

* Malarial Parasite

YEAR : 2013			
INFECTIONS	VOLUNTARY DONORS	REPLACEMENT DONORS	TOTAL
	(Total No.38)	(Total No. 974)	(Total No. 1012)
HIV	0	2 (0.20%)	2 (0.19%)
HBV	1 (2.63%)	9 (0.92%)	10 (0.98%)
HCV	0	0	0
SYPHILIS	0	18 (1.84%)	18 (1.77%)
MP*	0	0	0
TOTAL	**1 (2.63%)**	**29 (2.97%)**	**30 (2.96%)**

* Malarial Parasite

YEARS 2011 – 2013			
INFECTIONS	VOLUNTARY DONORS	REPLACEMENT DONORS	TOTAL
	(Total No.91)	(Total No. 2087)	(Total No. 2178)
HIV	0	2 (0.09%)	2 (0.09%)
HBV	1 (1.09%)	15 (0.71%)	16 (0.73%)
HCV	0	2 (0.09%)	2 (0.09%)
SYPHILIS	1 (1.09%)	35 (1.67%)	36 (1.65%)
MP*	0	0	0

* Malarial Parasite

Table 4: Year Wise Break-up of Seropositive Blood Donors

Year	Total No. of Donors	HIV	HBV	HCV	Syphilis	Malaria
2011	301	0	1	0	10	0
2012	865	0	5	2	8	0
2013	1012	2	10	0	18	0
Total	**2178**	**2**	**16**	**2**	**36**	**0**
Prevalence Rate		0.09%	0.73%	0.09%	1.65%	0.00%

Table 5: Comparision of Ttis Prevalence Rate in Different Parts of India

Place	HIV%	HBV%	HCV%	Syphilis%	Reference
Bangalore (Karnataka)	0.44	1.86	1.02	1.6	Srikrishna A et al(1999)
Ludhiana (Punjab)	0.084	0.66	1.09	0.85	Gupta N.et al(2004)
Delhi	0.56	2.23	0.66	–	Pahuja S et al(2007)
West Bengal	0.28	1.46	0.31	0.7	Bhattacharya P et al(2007)
Lucknow (UP)	0.23	1.96	0.85	0.01	Chandra T et al(2009)
Southern Haryana	0.3	1.7	1	0.9	Arora D et al(2010)
Ahmedabad (Gujarat)	0.16	0.98	0.11	0.23	Shan N and Shah J M et al(2013)
Ranchi (Jharkhand)	0.08	1.01	0.1	0.03	Sundaram S et al(2015)
Present Study	0.09	0.73	0.09	1.65	2016

Discussion

Globally mass of evidence supported that blood transfusion is an efficient route of TTIs transmission. [7] Therefore prescribing decisions should be based on national guidelines on the clinical usage of blood; taking the individual patients needs into consideration, with minimum cost and wastage, optimum safety and efficacy. [8] Despite of pre-donation counselling and medical fitness tests, the presence of TTI is inevitable in blood donations. With every unit of blood, there is 1% chance of transfusion associated problems including TTI. The risk of TTI has declined dramatically in high income nations over the past two decades, but the same may not hold good for the developing countries. The national policy for blood transfusion services in our country is of recent origin and the transfusion services are hospital based and fragmented. Voluntary donors are motivated blood donors who donate blood at regular intervals and replacement donors are usually one time blood donors who donate blood only when a relative or a friend is in need of blood. [9]

Investigation of the prevalence TTIs is often conducted in blood donor population because of convenience and access to a large sample size. They are generally considered a healthier segment of the community and have been used as a surrogate marker for the prevalence of infection in the population at large. [7]

Voluntary donors constituted 4.17% as compared to 95.83% of replacement donors. This findings are similar with results of the earlier studies. [10-15] Majority of the donors 56% were aged between 18- 30 years which is in keeping with the age of college students who are often called to donate at our institution. Other study has similar age distribution (68%). [2] Ninety – eight percent (98%) donations were from males, a finding similar to the other studies. [2,9,16] This could be explained on the basis that the Indian women have a very high incidence of anemia especially in the child bearing ate and hence are likely to face disqualification while being screened for blood donation.[2]

Overall prevalence of TTI was 2.57% with a higher prevalence in replacement donors and male donors. In present study prevalence of HIV, HBV, HCV and Syphilis were 0.09%, 0.73%, 0.09%, 1.65% respectively. Many of the Indian studies show prevalence rates for HIV 0.51 – 3.87%, HCV 0.12-4%, HBV(HBsAg) 1.2-3.5% and Syphilis 0.3-0.82%.[10,11,14] A very low prevalence rate in my study may be attributed to increased number of donors donating at the blood bank with strict screening criteria when compared to the number of donations from the camps as well as because of small sample size.[2]

In present study, prevalence of HIV is correlated with all of the studies mentioned in Table 5. While HBV prevalence correlates with Ludhiana[17] and Ahmedabad (Gujarat)[22] center studies. (Table 5)

Various studies in India have shown the sero-prevalence of HCV ranging from the lowest (0.14%) in the study by Sunderam S et al[23] in 2015 to the higher one of 1.09% (Gupta et al, 2004[17]). A significantly lower prevalence of HCV (0.09%) has been noted in present study. (Table 5)

Sexually transmitted infections are widespread in developing countries and constitute a major public health problem. The TPHA reactivity in my study was 1.65% which is compared to study done by Srikrishna A et al . [15] (Table 5).

The reason for wide variations of HBV and HCV prevalence may be either a particular geographical distribution or declining rate of its positivity in healthy population. The wide variations of HBV and HCV sero-prevalence in different studies in India might be due to the use of different generation ELISA kits, having different sensitivities and specificities. [9]

Conclusion

Despite stringent donor screening and testing practices, safe blood free from TTIs remains an elusive goal because the threat of TTIs agents entering the blood supply is not static. This finding showed growing evidence in the burden of TTIs in blood donors.

Voluntary blood donors have significantly lower rates of prevalence for markers of TTIs as compared to replacement blood donors. Awareness of general population about voluntary regular blood donation should be created to minimize the chances of spreading transfusion transmitted infections. Replacement donors carry a relatively higher risk of transfusion transmitted infections due to chances of missing professional donors during donor screening procedures. Hence blood from replacement donors should be accepted only in cases of dire emergencies when transfusion of blood or blood products would be lifesaving.

The major concern in transfusion services today is increased seropositivity among replacement donors for HCV, HIV, HBsAg and syphilis. With the advent of nucleic acid amplification techniques (NAT), western countries have decreased the risk of TTI to a major extent. But the cost – effectiveness of NAT is poor. The NAT has added benefits but its high financial cost is of concern, especially in underdeveloped countries like India. Apart from NAT for donor screening, other factors such as public awareness, vigilance of errors, educational and motivational programs are sure to help in decreasing the infections.

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