

Trends of transfusion transmissible infections among blood donors in a rural medical college of West Bengal, India

Kuntala Ray¹, Hironmoy Roy^{2*} and Mridumay Das³

¹Department of Community Medicine, College of Medicine and Sagore Datta Hospital, Kamarhati, Kolkata, West Bengal, India, ²Department of Anatomy, North Bengal Medical College, Sushruta Nagar, Darjeeling, West Bengal, India and ³MOIC & Director, Regional Blood Transfusion Centre (RBTC), North Bengal Medical College Hospital, Sushruta Nagar, Darjeeling, West Bengal, India

Abstract: *Background:* Blood transfusion is a life-saving therapy in different medical and surgical emergencies. It also has great public health importance. *Objective:* The present study was conducted to find out the prevalence of transfusion transmissible infection (TTI) among blood donors, donated blood at the blood bank of North Bengal Medical College, in the reference time period (2008-2014), West Bengal, India. *Methods:* The Descriptive cross sectional record based study was conducted among all units of blood collected from reference period. The retrospective study was conducted in March-May 2015. All voluntary and replacement donors reporting to the blood bank were screened for HBsAg, Hepatitis C Virus (HCV), HIV and Syphilis by using the appropriate enzyme-linked immunosorbent assay. HIV testing was done using fourth generation ELISA kits. Test for syphilis was done by VDRL. Malaria was tested using Leishman stained peripheral blood smear. *Results:* A total of 86847 donors donated blood over 7 years, among them 77.3% were males. The seropositivity for various TTIs was found to be 17.48% for HIV, 42.09% for HBsAg, 25.65% for HCV, 14.52% for syphilis and 0.24% for malarial parasite (MP). *Conclusion:* Blood is still a main source of transmission of infections among donors in rural West Bengal.

Keyword: Transfusion Transmissible Infection, Sero-prevalence, Blood donors.

Introduction

Transfusion of blood and blood product is a life saving treatment procedure. It can be a source of transfusion transmitted diseases if proper screening of donated blood is not done [1]. An integrated strategy for blood safety is required for elimination of transfusion transmissible infections (TTI) and for provision of safe and adequate blood transfusion services to the people. The main component of an integrated strategy include collection of blood only from voluntary, non-remunerated blood donors, screening for all TTIs and reduction of unnecessary transfusion [2].

Transfusion transmitted infection is the major problem associated with blood transfusion practice. However, with good quality control practice starting from history taking and extending up to lab practices, one can minimize such events. Hepatitis B, Hepatitis C and Human Immunodeficiency virus are the three most important agents. It is now mandatory to screen all donated blood units, whether replacement or

voluntary for five transfusion transmitted diseases-namely human immunodeficiency virus (HIV), hepatitis B and C, syphilis, and malaria [3].

Safe blood in adequate quantity has become all the more important due to increasing dangers of AIDS and other transmissible infections [4]. The prevalence of HIV in India is 0.3% among the general population [5]. The prevalence of HIV among blood donors was noted to have a wide range between 0.02% and 8.5% in various studies [6-8]. Estimate by WHO for current infection rate in Asia suggest that about 1 in 250 adults is infected with virus. Therefore the need for testing for HIV infection has become crucial for surveillance, prevention and screening of donated blood [9].

According to the World Health Organisation (WHO), HBsAg (Hepatitis B surface antigen) prevalence among the general population ranges from 0.1% to 11.7% [10]. HBV

prevalence in the general population in India is 2-8% and 1-2% in the blood donors, according to various studies [11-12]. Approximately 3% of the world population is infected with Hepatitis C virus (HCV) [13]. The global sero-prevalence of HCV among blood donors varies from 0.4% to 19.2%. However, overall HCV prevalence in India has been reported to be less than 2% [13]. The hepatitis virus is seven times more prevalent than HIV. The test for VDRL reactivity and malarial parasite is mandatory but transmission of these diseases through blood transfusion is very low [14].

Apart from HIV no regular sero-surveillance for hepatitis B and C and syphilis are usually conducted in the adult general population in India. As there was no large scale study on sero-prevalence of hepatitis B and C at regular interval sero-prevalence among blood donors can be used to monitor the trend of these TTIs in the apparently healthy adult population in community [15-16]. There is scarcity of studies on sero-prevalence of TTI at blood bank of North Bengal Medical College.

Objective: With this background the present study has been planned among the blood donors in the only tertiary care health institution of North Bengal with the following objectives:-

1. To find out the prevalence of transfusion transmissible infection (TTI) among blood donors, donated blood at the blood bank of North Bengal Medical College, in the reference time period (2008-2014).
2. To evaluate trends over years of transfusion transmissible infection (TTI) among blood donors, donated blood at the blood bank of North Bengal Medical College, in the reference time period (2008-2014).

Material and Methods

The Descriptive cross sectional record based study was conducted among all units of blood collected in the blood bank of North Bengal Medical College, from the year 2008 up to 2014 (reference period). The retrospective study was conducted in March-May 2015. After the permission from Institutional Ethics Committee & the head of the institution, the study was carried out blood bank attached to a tertiary care hospital, North Bengal Medical College, West

Bengal, situated in a rural area of Matigara block of Darjeeling district in West Bengal; scattered over a huge area of 130 acres. It has sanctioned 599 beds with all speciality and some super-speciality departments. This blood bank is one of the largest in West Bengal and caters to the need of this medical college and other health institutions. All blood donations collected during the reference period were included.

All donors who had donated blood in this reference period were considered as study population. A consecutive sample of apparently healthy adult voluntary (motivated blood donor, who donates at regular intervals) and replacement (usually one time blood donor only when a relative is in need of blood) blood donors, were screened for five mandatory tests for transfusion transmitted infections namely: HIV, hepatitis C virus (HCV), hepatitis B surface antigen (HBsAg), syphilis, and malaria routinely. The subjects included all replacement and voluntary blood donors. Each donor was included only once in the study.

- **Inclusion criteria:** The eligibility criteria for the donors, i.e.,
 1. healthy men and non-pregnant non lactating women
 2. age between 18 and 60 years,
 3. minimum weight of 45 kg,
 4. hemoglobin levels above 12.5 g/dl for females and 13.5 g/dl for males
 5. no history of hepatitis B and hepatitis C and sexually transmitted infections,
 6. no history of jaundice in past 1 year
- was strictly adhered to for recruitment of blood donors
- **Exclusion criteria:**
 1. Professional donor
 2. Current history of medication
 3. Those with a history of operation,
 4. Blood transfusion
 5. Radiotherapy or any form of cancer therapy

All the available data were reviewed. The epidemiological profile of the donors were studied and classified them according to gender, age, and type of donation, The transfusion transmitted infections namely:

HIV, hepatitis C virus (HCV), hepatitis B surface antigen (HBsAg), syphilis, and malaria serological test results were considered in either positive and negative. Pretested pre-design questionnaire, relevant records, available register were used as a tools of the study. Before onset of study, permission of institutional ethics committee was sought. The purpose of the study was clarified to the director of blood bank. Records review was done to obtain necessary information.

All of the donors were voluntary blood donors. As per the guidelines all the donors underwent a screening after obtaining a written consent. Screening of blood units was done by enzyme-linked immune-sorbent assay (ELISA) method for HIV and hepatitis B and C. HIV testing was done using fourth generation ELISA kits. Test for syphilis was done by VDRL. Any serum found reactive by the first assay was retested using a second assay based on different antigen preparations and/or different test principle using the anti-HIV test, HBsAg which is an immunochromatographic sandwich assay and HCV by the anti-HCV test.

Malaria was tested using Leishman stained peripheral blood smear up to the year 2008-2014. Any sample found reactive was retested for confirmation. Sero-positive units were discarded. The criteria for validity of ELISA tests given by the manufactures were considered. Cutoff value for reporting positive results was calculated as per manufacturer's directions. All records were collected from blood bank records maintained as per Drugs and Cosmetic Act of India.

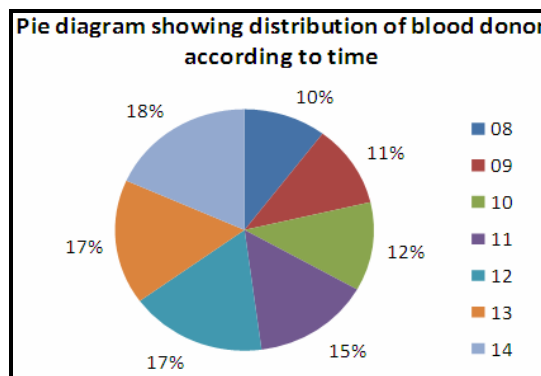
Data were collected in excel data sheet and the data was then analysed by calculating descriptive statistics using SPSS version 16.0.

Results

A total of 86847 donors donated blood over 7 years (2008-2014). The number of replacement donors was 15005 and 71842 voluntary donations were received. The fig 1 shows that majority of blood donation 18.3% were done in the year 2014, followed by 17.1% in 2012. Lowest proportion of blood donation 10.3% was found in 2008. But the trend shows increasing with time. Out of total blood donor 82.7% were voluntary donor. Among the total voluntary donor

maximum 18.4% were participated in the year 2014. For replacement donor majority (21.7%) were in the year 2011. The trend of blood donation was also increase with the passage of time.

Fig-1: Pie diagram showing distribution of blood donor according to time



Out of total blood donors 67121(77.3%) was males and rests were female. In the year 2009 more than 83% blood donation done by males and almost 26% were contributed by females in the year 2013. Among all males, 84.2% were voluntary and maximum participation, 90.4% was seen in the year 2013 followed by 2012, i.e. 87.5%. Among females majority were voluntary donor (78.2%). Only in the year 2010, 34.5% were replacement donor.

Table 1 shows that, majority of blood donors were 21-40 yrs of age. In the year 2012 more than 50% of blood donors were within 21-30 yrs. Only 3.4% blood donor were more than 50 years in 2012 which was also lowest in all time frame. The study results revealed that blood group B was most common (54.0%) type of blood donated throughout the 7years; and the least common blood group was AB (5.3%). This result was consistently same throughout the time period. 73.9% of donated blood was Rh positive. Only in the year 2012 more than 30% of donated blood was Rh negative.

From this study, it was found that cumulative sero-prevalence for HIV was 0.56 % where as HbsAg was positive 1.36% of total donated blood. MP was found to be positive only for 7 cases. The total number of donors who were found positive for transfusion transmissible infections (TTIs) was 2803/86847 (3.22%).

The male: female (M:F) ratio among the infected donors was 3.8:1. The seropositivity for various TTIs was found to be 490/2803 (17.48%) for HIV, 1180/2803 (42.09%) for HBsAg, 719/2803

for HCV (25.65%), 407/2803 (14.52%) for syphilis and 7/2803 (0.24%) for malarial parasite (MP).

Table-1: Age distribution of blood donor in different time frame (N=86847)

Age (in years)	Years							Total F(%)
	2008 F(%)	2009 F(%)	2010 F(%)	2011 F(%)	2012 F(%)	2013 F(%)	2014 F(%)	
≤20	568 (6.3)	721 (7.5)	807 (7.7)	1059 (8.3)	679 (4.6)	903 (6.3)	881 (5.5)	5618 (6.5)
21-30	3984 (44.6)	4055 (42.5)	4132 (39.6)	5892 (46.3)	7531 (50.8)	6445 (44.5)	6212 (39.1)	38251 (44.0)
31-40	2347 (26.3)	3007 (31.5)	3929 (37.7)	4117 (32.3)	5048 (34.0)	5269 (36.4)	6158 (38.7)	29875 (34.4)
41-50	1618 (18.1)	1178 (12.3)	909 (8.7)	1157 (9.1)	1074 (7.2)	1123 (7.8)	1883 (11.8)	8942 (10.3)
51-60	415 (4.7)	591 (6.2)	643 (6.2)	507 (4.0)	496 (3.4)	735 (5.0)	768 (4.9)	4155 (4.8)
Total	8932 (100.0)	9552 (100.0)	10420 (100.0)	12732 (100.0)	14828 (100.0)	14481 (100.0)	15902 (100.0)	86846 (100.0)

Table-2: Gender wise distribution of sero-reactive donor (N=86847)

Gender	Blood donor	Serological report				Total N (%)
		HIV N (%)	HbsAg N (%)	HCV N (%)	VDRL N (%)	
Male	67121	406 (0.60)	935 (1.39)	567 (0.84)	312 (0.46)	2220 (3.30)
Female	19726	84 (0.43)	245 (1.24)	152 (0.77)	95 (0.48)	583 (2.95)
Total	86847	490 (0.56)	1180 (1.36)	719 (0.83)	407 (0.47)	2803 (3.22)

Fig-2: Trend of Transfusion Transmissible Infections in different years

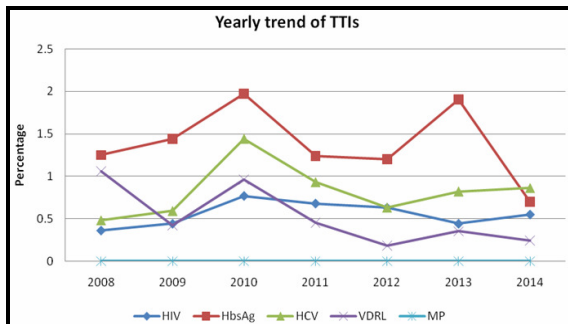
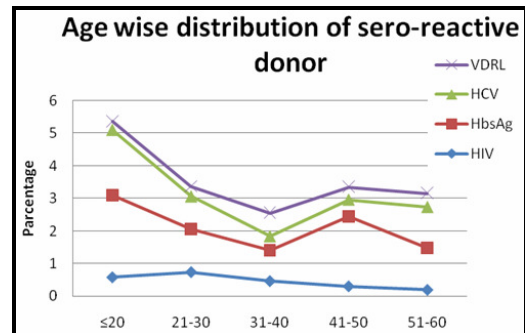


Fig-3: Line diagram showing age wise distribution of sero-reactive donor



The fig 2 revealed that sero-prevalence of HIV positive and HCV positive blood was maximum 0.77% and 1.44% in the year 2010. HbsAg was found to be maximum 1.97% in the year 2010 and followed by 1.90% in the year 2013. Sero prevalence of HIV was least 0.36% in 2008. Then the trend goes high over time and again became static to 0.55%.

Figure 3 shows Age distribution of positive serological test of blood donors, where, maximum sero-positivity of HIV was found

(0.74%) among blood donor 21to 30 yrs, followed by donor of less than 20 yrs of age. HbsAg positive and HCV positive blood donors of less than 20 yrs were found to become 2.52% and 1.99% respectively.

The table 3 shows among the replacement donor sero-positivity were higher in HIV (2.44%), HbsAg (5.94%), HCV (3.84%) and VDRL (2.22%). All 7 MP positive cases were replacement donor.

Type of Blood donor	Frequency	Serological report					Total
		HIV N (%)	HbsAg N (%)	HCV N (%)	VDRL N (%)	MP N (%)	
Voluntary	71842	123 (0.17)	289 (0.40)	143 (0.19)	73 (0.10)	0	623 (0.87)
Replacement	15005	367 (2.44)	891 (5.94)	576 (3.84)	334 (2.22)	7	2180 (14.5)
Total	86847	490 (0.56)	1180 (1.36)	719 (0.83)	407 (0.47)	7 (0.001)	2803 (3.22)

Discussion

The present study was carried out in the blood bank of North Bengal Medical College and Hoospital, situated in foothills of Darjeeling District, west Bengal. The data was analysed from January 2008 to December 2014. The total number of blood donor in this 7 years of study period was 86847; of this 71842(82.7%) were voluntary donor and the remaining (15005) was replacement donor. This result was not consistent with the study done at S. R.T. Rural Medical College and Hospital Blood Bank, District Beed, Marathwada region, Ambajogai by BR Sonwane et al. where 36.98% were voluntary donor and more than 63% were replacement donor [17].

A similar study done at a medical college Kolkata, West Bengal by Karmakar RP et al shows that 93% were voluntary donor donated blood at camps and rest are in house donor mainly relatives or friends of the patient requiring blood [18]. The present study revealed that proportion of blood donation was found maximum 18.3% in the year 2014 which is showing increasing trend over time. This results

was similar to the study done at blood bank of Lady Harding Medical College and associated hospitals in New Delhi done by Pahuja S [19]. The male female ratio of our study was found 4.13, 77.3% were male and rest were females. When further analysis was done it was found that males were more among both voluntary and replacement donor.

A study done at Indraprastha Apollo Hospitals, New Delhi by Makroo,R.N. et al showed 94% blood donors were males [20]. Male female ratio (18:1) was also not matched with the study done by BR Sonwane et al [17]. Among the donors majority (44%) were 21 to 30 yrs of age followed by 34.4% were of 31-40 years. These results were corroborating with study done in Kolkata [18] where 68.7% blood donors were of 21 to 40 years and others studies [21-22].

In this study, B blood group (54%) was most common among donors followed by O (21%) and almost 74% were Rhesus factor positive. Similar results were found in the study done by Karmakar RP et al [18] Group B (36.33%)

and O (31.98%) were the two most prevalent blood groups among the donors but 97% were rhesus factor positive and only 3% were rhesus factor negative. In this study the overall seropositivity was found to be 3.22% and seroprevalence for replacement donor was more (14.5%) than voluntary donor (0.87%); which is quite similar with the result reveals in the study done in Kolkata [18] i.e. 2.79% donors were positive for any of the TTIs and seroprevalence among the donors in the camp was 2.78% and 2.89% among the in-house donors.

In our study seroprevalence is highest for hepatitis B infection (1.36%) followed by hepatitis C infection (0.83 %) and HIV (0.56%); lowest for Malaria parasite almost nil (0.0001%). This result was quite different to the study done in Dayanand Medical College & Hospital, Ludhiana [23], during the period of January 2001 to October 2003 in which HIV seropositivity was seen to be 37/44064 (0.084%) and few of these were also confirmed by western blot test. HBsAg seropositivity was 290/44064 (0.66%), anti HBe positivity was 49/44064 (0.11%), anti HCV positivity was found to be 483/44064 (1.09%) and syphilis positivity was found to be 373/44064 (0.85%).

The study was carried out at blood bank of a rural tertiary care teaching hospital in Maharashtra, India [24] in 2009-10; showed that overall seroprevalence of HBV and HCV was 1.09% and 0.74% respectively, while the prevalence of VDRL and HIV was 0.07%. The highest prevalence was observed for HBV followed by HCV, syphilis and HIV in decreasing order.

There were 955 seropositive patients with an overall seroprevalence of 2.9% seen at blood bank at Christian Medical College, Ludhiana, Punjab in a three year cross sectional study from 2008-10 [25]. Among these seropositive patients 88 were HIV, 364 were HBV and 503 were HCV positive with a seroprevalence of 0.27%, 1.11%, and 1.53%, respectively. Jain et al also observed prevalence of anti HCV 1.57% in New Delhi [26]. In the present study the hepatitis B was the most prevalent infection, similar to other studies from India [18, 27]. When the trend of infection analyzed our study revealed that HIV showed almost stabilization in trend throughout the 7 years of study period, where as VDRL and HCV

infection showed downward trend 2011 onwards. Hepatitis B infection was also showed decreasing trend in last year.

This result was also corroborating with the findings showed by Karmakar PR et al, [18] that Hepatitis B prevalence had shown a downward trend in the donors from 2009 to 2011. Hepatitis C prevalence in this study (0.59%) was seen lower compared to our study. A downward trend was observed in the prevalence of hepatitis C in the blood bank of Kolkata from 2009 to 2011.

In a study done at the blood bank of a tertiary care center, Uttarakhand by Negi G et al [1], had shown that moderate fluctuations were observed in the initial years for nearly all TTIs, but the last few years have showed static rate in the trend with a mild reduction in the incidence of HBsAg, HCV, and Venereal Disease Research Laboratory (VDRL) positivity. Malaria was found to be present in 0.03, 0.33, and 0.57% in studies from India and Pakistan (Bahadur *et al.*, and Ali *et al.*) [28-29] respectively; and 30.2 and 51.5% in studies from Nigeria [30-31]. Screening methods used may responsible for the fluctuations in trends.

In the study done in Kolkata [18] found that more than two-third seropositive (69.36%) were in the age group of 21-40 years of age. This trend held true for all the infections. Seroprevalence was least in the 18-20 year age group and then increased up to 50 years, followed by decline in 51-60 years age group. In our study seroprevalence of any TTI was highest among donors of less than 20yrs of age.

According to study done by Koshy, et al [25] most of the seropositive donors were among the young productive population between 18 and 30 years of age followed by 31-40 years of age. According to the present study, overall seroprevalence among males (3.30%) was found higher than females(2.95%).seroprevalence for HIV, hepatitis B, hepatitis C and syphilis among males was 0.6%, 1.39%, 0.84%, 0.46% respectively. According to the study done by Karmakar et al in Kolkata [18], seroprevalence of all the TTIs was more in

male than female. Seroprevalence for HIV, hepatitis B, hepatitis C and syphilis was 0.62%, 1.46%, 0.62% and 0.23% respectively in males and corresponding figures for female were 0.49%, 1.09%, 0.43% and 0.21% respectively.

The differences could even be due to the different laboratory procedures and reagents used among various blood banks. Added to this is the window period concept and all of these may lead to an over or underestimation of these infections.

Conclusion

Blood can save lives; however, it also carries the potential to transmit life-threatening infections. A moderately fluctuating trend was observed in our series for all infections with a mild reduction in

hepatitis B and C and syphilis infection in the recent years. Sensitive screening tests and a mandatory quality assurance system are essential to maintain blood safety.

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*All correspondences to: Dr. Hironmoy Roy, Assistant Professor, Department of Anatomy, North Bengal Medical College, Sushruta Nagar, Darjeeling, West Bengal, India. E mail: hironmoy19@gmail.com