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Seroprevalence of transfusion transmitted infections among blood donors in a tertiary care hospital of Uttarakhand, India: A ten years retrospective study

[1]Saloni Upadhyay, Department of Blood Transfusion and Department of Pathology, Government Medical College, Haldwani, Nainital, Uttarakhand

[2]Bharat Bhushan, Department of Dental Surgery, Government Medical College, Haldwani, Nainital, Uttarakhand

[3]Ritu Upadhyay, Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh

[3]Mansi Bhardwaj, Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh

Corresponding Author: Bharat Bhushan, Department of Dentistry, Government Medical College, Haldwani, Nainital, Uttarakhand - 263139, India

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Abstract

This study was aimed to determine the seroprevalence of transfusion transmitted infections (TTI) in healthy blood donors groups in a tertiary care blood bank. A retrospective study was carried out over a period of 10 years between January 2010 and 2019. A total of 90959 blood donors in age group between 18-60 years were included in the study. Most of the volunteers were male (> 90%). The serum samples were screened for HBsAg, Ag and Ab of HIV type 1 and type 2, Kit 4 generation for P24 Ag. Hepatitis C virus, rapid testing by Mitra and Elisa testing by Tulip diagnostic and syphilis testing by crystal TP card test malaria (male card) among the healthy donors. Percentage in all: HBsAg (0.88%), HCV (0.95%), HIV (0.06%), VDRL (0.05%), Malaria (0.02%), in downward trend namely; HCV, HBsAg, HIV, Syphilis, Malaria were studied according to their blood groups. Seropositivity rate was increasing among males in our study. The study shows the seroprevalence of the general population in our area of Uttarakhand which may be reflecting public health intervention of strategies. In our retrospective study of 90,959 donors, we estimated downward trends namely in HCV, HBsAg, HIV, Syphilis, Malaria were 0.95%, 0.88%, 0.06%, 0.05%, 0.02% according to the blood group.

Keywords: Retrospective, Seroprevalence, Tranfusion Tranmitted Infection

Introduction

World Health Organization (WHO) has made mandates to screen the pre-transfusion blood, test for Transfusion Transmissible Infections (TTIs) namely Human Immunodeficiency virus (HIV), Hepatitis B virus (HBV), Hepatitis C virus (HCV), syphilis, malaria [1]. Infection can be transmitted during asymptomatic phase. Thus, blood transfusion can contribute to an increase in the infection risk. Unsafe blood transfusion is costly and unsafe for both recipient and society. For

the protection of human life, an updated screening of TTIs is essential. Nucleic acid test (NAT) can be used to carry out TTIs screening of blood samples [2]. Complication of blood transfusion may be mild or life threatening. A careful collection of blood from the donors is mandatory to ensure safety of the blood. Evaluation of TTIs is essential for safety of blood supply which is of utmost importance in transfusion medicine [3]. TTIs hamper blood safety and cause serious public health issues [4].

Methods

A retrospective study was conducted for a period of 10 years from January 2010 to December 2019. All the blood donors who reported to the blood bank at Government Medical College, Haldwani, Uttarakhand, India or enrolled in outreach voluntary blood donation camps during the study period and who satisfied the criteria for blood donation were included in the study. The inclusion criteria included: age between 18 to 60 years, minimum 50 Kg body weight, minimum 12.5 g % haemoglobin content, pulse rate between 100 to 180 mm Hg, and normal body temp and oral temp not exceeding 37±0.5°C. Analysis of blood samples was carried out by ELISA method ensuring rapid assays for surveillance. All the reactive samples were labelled as seropositive, disinfected, and discard.

Results

Whole blood donations were collected from 90,959 donors between January 2010 and December 2019. Out of these 84,578 were voluntary donations and 6,381 were replacement donations. Demographic characteristic associated with all donations (*i.e.* 90,959) > 98% were male donors. Majority were the cases of Hepatitis C (867 cases) 0.95%, followed by HBsAg cases (808 cases) 0.88%. The seroprevalence of HIV cases was 63, Syphilis 49 cases and Malaria 2 cases only; which was 0.06%, 0.05% and 0.02%, respectively.

Table 1: Total blood collection and type of donors from 2010 to 2019.

Year	Total blood donors	Voluntary donors N (%)	Replacement donors N (%)
2010	6708	4363(65.04)	2345 (34.95)
2011	8695	6387 (73.45)	2308 (26.54)
2012	8036	7854 (97.7)	318 (3.95)
2013	8894	8559 (96.2)	330 (3.71)
2014	8572	7830 (91.3)	702 (8.81)
2015	10687	10590 (99.09)	97 (0.90)
2016	10485	10403 (99.21)	82 (0.78)
2017	10624	10547 (99.27)	77 (0.72)
2018	10487	9418 (89.80)	69 (0.65)
2019	8771	8625 (98.33)	53 (0.60)
Total	90959	84578 (92.9)	6381 (7.01)

Discussion

In the present study, the voluntary donors were more than the replacement donors. Over a period of 10 years there was inclining trends of voluntary donors (Table 1). These findings are similar to the studies reported by Gupta *et al* [5]. This could be due to the launch of

voluntary blood donation program by the Government of Uttarakhand and also due to the voluntary blood donation program organized on world blood donation day. Trends of seroprevalence of transfusion transmitted infections among blood donors from 2010 to 2019 are presented in Figure 1-3.

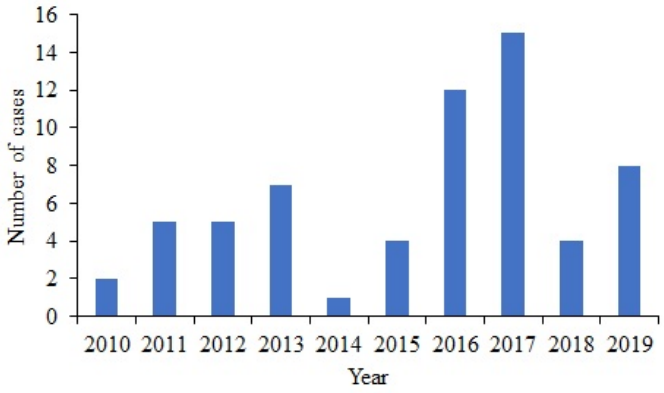

Figure 1: Trends of seroprevalence of transfusion transmitted infections among blood donors for HIV from 2010 to 2019.

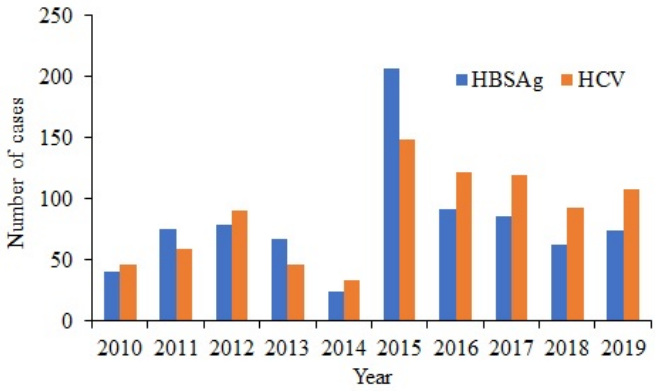

Figure 2: Trends of seroprevalence of transfusion transmitted infections among blood donors for HBsAg and HCV from 2010 to 2019.

Voluntary donors donated blood on regular intervals. Of blood donors 92.9% were voluntary blood donors and 7.01% were replacement donors. This is comparable to the study done by Gupta *et al.*[5] and Pallavi *et al* [6]. The seroprevalence of HBV, HCV, HIV and syphilis was 1.30%, 0.25%, 0.26%, and 0.28%, respectively (Fig. 1 and 2), which is comparable to the TTIs reported by Fiekumo *et al* [7] as 18.6%, 6%, 3.1%, 1.1% for HBV, HCV, HIV and syphilis, respectively. In this case the only difference observed was the decreased incidence of HCV percentage than HIV percentage in present study. Pallavi *et al* [6], Bhattacharya *et al* [8], Anjali *et al* [9], Tessema *et al* [10], and Stokx *et al* [11] reported a lower incidence of seroprevalence of HCV (%) then the results obtained in the present study. Adhikari *et al* [12] reported lower seroprevalence of both HBsAg and HCV as 0.78 and 0.27%, respectively when compared to the results of present study. The seroprevalence rate of HIV, HBsAg, HCV, syphilis was much lower than the study conducted by Nagalo *et al* [13], Matee *at el* [14], Tafuri *et al* [15] and Fiekumo *et al* [7] (Table 2).

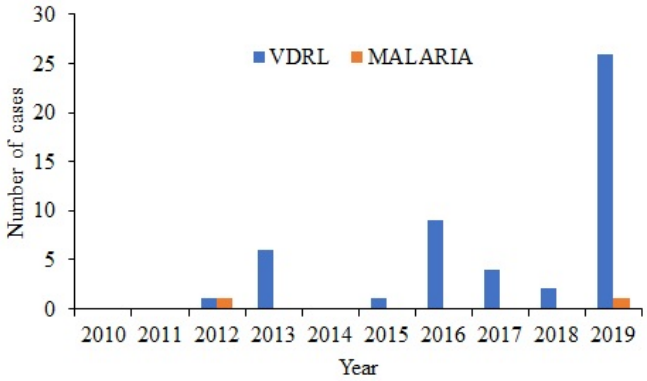

Figure 3: Trends of seroprevalence of transfusion transmitted infections among blood donors for malaria and syphilis (VDRL) from 2010 to 2019.

The present study was carried in an academic institute where awareness about TTIs was created among the donors before donating blood. This could be the reason of quite lower prevalence of TTIs than the previous reports. Among the 90,959 donors, 1789 (1.96%) were seropositive donors. No co-infections were observed in 2010, 2011 and 2014. But, in year 2013, 3 cases were found in O^+ and O^- patients. In the year 2015, 5 cases were found with different seropositive combinations. In year 2017 and 2018 only 2-2 cases were found,

respectively. However, in 2019 a total of 6 cases were found.

Table 2: The comparative results of present study of transfusion transmitted infections prevalence with previous literature.

Study	HIV%	HBsAG%	HCV%	Syphilis%	Ref.
Bhattacharya *et al*. (2007), West Bengal, India	0.28	1.46	0.31	0.72	[8]
Adhikari *et al*. (2010), Sikkim, India	0.32	0.78	0.27	0.27	[12]
Pallavi *et al*., (2011), Mysore, India	0.44	1.27	0.23	0.28	[6]
Anjali *et al*. (2012) Kerla, India	0.60	1.50	0.40	0.10	[9]
Nagalo *et al*., (2011), Koudougou	2.21	14.96	8.69	3.96	[13]
Matee *et al*., (2006), Tanzania	3.80	8.80	1.50	4.70	[14]
Fiekumo *et al*., (2009), Nigeria	3.10	18.60	6.00	1.10	[7]
Tafuri *et al*., (2010), Italy	1.50	8.30	4.50	1.50	[15]
Tessema *et al*., (2010), Northwest Ethopia	3.80	4.70	0.70	1.30	[10]
Stkx *et al*., (2011), Mozambique	8.50	10.60	0.00	1.20	[11]
Present study	**0.06**	**0.88**	**0.95**	**0.05**	

Co-infections increases with passing years. According to the blood groups, 7 cases were found in O^+ within 10 years followed by 6 cases in A^+ and 5 cases in B^+ blood groups with different combination of seropositive cases as presented in Table 3.

HBV is highly contagious and can spread from one individual to another by the transfusion during birth, unprotected sex and sharing needles. Syphilis can be spread by sexual contact, blood transfusion and vertical transmission. Due to the nature of blood born virus, HCV has been recognised as major causative agent for post transfusion of non-A, non-B hepatitis (HCV). Other less common routes of transmission are sexual intercourse and mother to child. In case of HIV transmission during window period is possible even if each unit is tested.

For the HIV antibodies possibility of window period transmission would be minimised if the blood is collected from the targeted donor [16]. Sexually transmitted HBV incidence is higher in population. HBV positivity indicates a carrier state or an active infection. These seropositive donors may progress to develop chronic hepatitis, cirrhosis and even progress to hepatocellular carcinoma [15, 17]. Patients requiring blood transfusion are more prone to the acquire HBV, HIV, HCV, and Syphilis [18]. The course of HBV infection depends on several factors such as immune system, host genetic factors and genetic variability of viruses [19].

Table 3: Co-infections over the span of 10 years according to blood groups

Year	A^+	A^-	B^+	B^-	O^+	O^-	AB^+	AB^-
2010	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
2011	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
2012	HBsAg+HCV	Nil	Nil	Nil	Nil	Nil	Nil	Nil
2013	Nil	Nil	Nil	Nil	HBsAg+HCV HBsAg+HCV	HBsAg+HCV	Nil	Nil
2014	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
2015					Nil		Nil	Nil
2016	HBsAg+HCV HCV+HIV	Nil		Nil	HBsAg+HCV HBsAg+HCV	Nil	Nil	Nil
2017	Nil	Nil		Nil	HCV+ VDRL	Nil	Nil	Nil
2018	Nil	Nil	Nil	Nil	HCV+HIV	Nil	HCV+HIV	Nil
2019	HBsAg+HCV HCV+HIV HBsAg+VDRL	Nil	HCV+HIV	Nil	HBsAg+VDRL	Nil	HCV+HIV	Nil

Blood safety remains an issue of major concern in transfusion medicine. HBV and HIV can also be transmitted from person to person contact. HBV is transmittable from tears, urine, *etc*. Seroprevalence of HBsAg ranges from intermediate (2% - 7%) to high (> 8%) levels in India. High prevalence rate of 10% has been reported in Southern China, Korea, Melanesia, the Philippines, India, Indonesia, Japan, and Pakistan. However, these rates may be inaccurate and possible the tip of the iceberg as rates of occult HBV infection is not included in this [20].

Each unit of blood has about 1% chance of TTIs [6]. Asian subcontinent has intermediate to high rate of chronic infection. HBV infections can escape detection and enter the blood supply. To minimize the risk of seroprevalence, the blood should be collected from regular blood voluntary donors. effective donor education and counselling make aware the general public about the increased infectious nature of the disease. Special intervention programs should be planned [21]. Similarly, the 4th generation test (p 24 Ag) should be done, which reduces the window period from 15 to 21 days. NAT also reduces the window period up to 5 days. However, NAT is costly which makes its unaffordable for many centres [22].

Conclusions

The study reflected seroprevalence of general public population in our area which may be detected in the public health individual strategies. In a 10 years retrospective study of 90,959 donors, seropositive cases were as HCV (0.15%), HBsAg (0.8%), HIV (0.06%), VDRL (0.05%) and malaria (0.02%). A downward trend according to blood group was observed. HBsAg was increased in B^+ group (0.29 %), HCV is 0.26% in O^+, HIV is 0.02% in O^+, VDRL is 0.02% in B^+ and malaria is very low, 0.002 percentage in B^+ blood group, respectively. The study concluded that the

screening of donors and use of NAT assay will reduce risk of TTIs.

References

1. Blood safety and availability. World Health Organization. Available from http://www.who.int/mediacentre/factsheets/fs279/en/. Accessed on: 08.05.2020.
2. 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. Journal of Laboratory Physicians. 2017;9(4):283.
3. Jeremiah ZA, Koate B, Buseri F, Emelike F. Prevalence of antibodies to hepatitis C virus in apparently healthy Port Harcourt blood donors and association with blood groups and other risk indicators. Blood Transfus. 2008; 6:150–5.
4. Buseri FI, Muhibi MA, Jeremiah ZA. Sero-epidemiology of transfusion-transmissible infectious diseases among blood donors in Osogbo, South-West Nigeria. Blood Transfus. 2009; 7:293–9.
5. Gupta N, Kumar V, Kaur A. Seroprevalence of HIV, HBV, HCV and Syphilis in voluntry blood donors. Indian J Med Sci. 2004; 58:255-7.
6. Pallavi P, Ganesh CK, Jayashree K, Manjunath GV. Seroprevalence and trends in transfusion transmitted infections among blood donors in a University Hospital blood bank: A 5 year study. Indian J Hematol Blood Transfus. 2011; 27:1–6.
7. Fiekumo IB, Musa AM, Jeremiah ZA. Seroepidemiology of transfusiontransmissible infectious diseases among blood donors in Osogbo, South-west, Nigeria. Blood Transfusion. 2009; 1:1-10.
8. Bhattacharya P, Chandra PK, Datta S, Banerjee A, Chakraborty S, Rajendran K, Basu SK, Bhattacharya SK, Chakravarty R. Significant increase in HBV, HCV, HIV and syphilis infections among blood donors in West Bengal, Eastern India 2004-2005: Exploratory screening reveals high frequency of occult HBV infection. World J Gastroenterol. 2007; 13:3730–3.
9. Anjali H, Issac A, Anjali MR, Anish TS. Transfusion-transmissible infections among voluntary blood donors at Government Medical College Thiruvananthapuram, Kerala, India. Asian J Transfus Sci. 2012; 6:55–6.
10. Tessema B, Yismaw G, Kassu A, Amsalu A, Mulu A, Emmrich F, Sack U. 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.
11. Stokx J, Gillet P, De Weggheleire A, Casas EC, Maendaenda R, Beulane AJ, Jani IV, Kidane S, Mosse CD, Jacobs J, Bottieau E. Seroprevalence of transfusion-transmissible infections and evaluation of the pre-donation screening performance at the Provincial Hospital of Tete, Mozambique. BMC Infect Dis. 2011; 11:141.
12. Adhikari L, Bhatta D, Tsering DC, Sharma DK, Pal R, Gupta A. Infectious disease markers in blood donors at Central Referral Hospital, Gangtok, Sikkim. Asian J Transfus Sci. 2010;4:41–2.
13. Nagalo MB, Sanou M, Bisseye C, Kaboré MI, Nebie YK, Kienou K, Kiba A, Dahourou H, Ouattara S, Zongo JD, Simporé J. Seroprevalence of human immunodeficiency virus, hepatitis B and C viruses and syphilis among blood donors in

Koudougou (Burkina Faso) in 2009. Blood Transfus. 2011; 9:419–24.

14. Matee MI, Magesa PM, Lyamuya EF. Seroprevalence of human immunodeficiency virus, hepatitis B and C viruses and syphilis infections among blood donors at the Muhimbili National Hospital in Dar es Salaam, Tanzania. BMC Public Health. 2006;6:21.
15. Tafuri S, Prato R, Martinelli D, Melpignano L, De Palma M, Quarto M, Germinario C. Prevalence of hepatitis B, C, HIV and syphilis markers among refugees in Bari, Italy. BMC Infect Dis. 2010; 10:213.
16. Azarkeivan A, Nasiritoosi M, Kafiabad SA, Maghsudlu M, Hajibeigi B, Hadizadeh M. Evaluation of new cases of HCV infection in thalassaemia patients for source of infection. Asian J Transfus Sci. 2011; 5:132–5.
17. Elghannam DM, Aly RM, Goda EF, Eltoraby EE, Farag RE. Clinical significance of antibody to hepatitis B core antigen in multitransfused hemodialysis patients. Asian J Transfus Sci. 2009; 3:14–7.
18. Tiwari BR, Ghimire P, Kandel SR, Rajkarnikar M. Seroprevalence of HBV and HCV in blood donors: A study from regional blood transfusion services of Nepal. Asian J Transfus Sci. 2010; 4:91–3.
19. Kumar K, Kumar M, Rahaman SH, Singh TB, Patel SK, Nath G. Distribution of hepatitis B virus genotypes among healthy blood donors in Eastern part of North India. Asian J Transfus Sci. 2011; 5:144–9.
20. Purdy MA. Hepatitis B virus S gene escape mutants. Asian J Transfus Sci. 2007; 1:62–70.
21. Makroo RN, Chowdhry M, Bhatia A, Arora B, Rosamma NL. Hepatitis B core antibody testing in Indian blood donors: A double-edged sword! Asian. J Transfus Sci. 2012; 6:10–3.
22. Durro V, Qyra S. Trends in prevalence of hepatitis B virus infection among Albanian blood donors, 1999-2009. Virol J. 2011; 8:96.