

Analysing Factors Responsible for Transfusion Transmitted Infections (TTIs) among Reactive Blood Donors in a Blood Centre of Himachal Pradesh (H. P.): A Retrospective Data Analysis

Dr. Anjali Shrikant Chavan¹, Dr. Shweta Kanwal², Arsh Shrikant Chavan³

¹Assistant Professor, Transfusion Medicine and Blood Centre, Dr RPGMC Kangra at Tanda (H. P.)
Corresponding Author Email: [anjaliellare\[at\]gmail.com](mailto:anjaliellare[at]gmail.com)

²Faculty, RHFUTC Kangra at Chheb (H. P.)
Email: [shwetakanwal536\[at\]gmail.com](mailto:shwetakanwal536[at]gmail.com)

³Indian Institute Of Science Education and Research (IISER), Pune, Maharashtra
Email: [chavanarsh11\[at\]gmail.com](mailto:chavanarsh11[at]gmail.com)

Abstract: ***Background:** Unsafe blood transfusion has the potential to transmit diverse infections to blood recipients. Apparently healthy blood donors could sometimes be harboring infectious agents of which they are not aware. The present study was aimed to assess various factors responsible for Transfusion Transmitted Infections (TTIs) among blood donors in a Blood Centre of Himachal Pradesh (H. P.). **Materials and methods:** This was an Institutional based study with retrospective data analysis from "Seroreactive donor notification and recall register" and "Donor counselling, consent and referral forms" of reactive donors at Blood Centre, Dr RPGMC Kangra at Tanda (H. P.). Data collected was coded and then entered in Microsoft - excel spreadsheet and analysed using SPSS version 24. **Results:** Out of 182 donors 179 (98.4%) were males and most of them in age group of 30 - 45 years. Previous history of jaundice in self and IV drug abuse was statistically associated with TTIs ($p < 0.05$). Skin lesions like papules, pustules, pruritic lesions were present in 17.7% of VDRL reactive study participants at the time of post donation notification and counselling and the association was found to be statistically significant ($p = 0.00$). **Conclusion:** A need for better counselling practices, and for privacy during blood donor selection in blood centre and in outdoor camps was felt. Test seeking behaviour in donors should be discouraged. Proper counselling at the time of notification is emphasised upon.*

Keywords: Blood donor, Transfusion Transmitted Infections, Hepatitis B virus, Hepatitis C virus, HIV, Syphilis

1. Introduction

Blood transfusion saves many people every year that would otherwise have died because of various diseases and disasters⁽¹⁾. But unsafe blood transfusion has the potential to transmit a diverse of infections to blood recipients. These infections could be due to viruses, bacteria, protozoans, and/or prions⁽¹⁾. Viral agents include Human Immunodeficiency Virus (HIV)⁽²⁾, Hepatitis B virus (HBV) and Hepatitis C virus (HCV)⁽³⁾. Bacterial pathogens include among others Treponema, Yersinia, Pseudomonas, Klebsiella and Staphylococcus⁽⁴⁾. Plasmodium species and Babesia microti are examples of protozoan infections that can be transmitted through blood transfusion^(5, 6). Voluntary blood donors are considered as a safe source of blood, who donate blood for altruism and are of the general opinion that they are free of diseases as they have been donating blood and thus may not be aware about the silent nature of some of these infectious agents that they may be harbouring^(7, 8).

Thus keeping this in mind, the need to notify blood donors about reactive test results as part of the legal and ethical obligation of blood transfusion services dates back since the first testing on donated blood was started for Syphilis in the international scenario⁽⁹⁾.

However, the system of notification was more streamlined with the recognition of the Hepatitis and then Human

Immunodeficiency Virus (HIV) and their consequent reactivity in blood donors. In India, it is mandatory to test every unit of blood collected for Hepatitis B surface antigen (HBsAg), Hepatitis C antibodies (HCV), HIV 1 & 2 antibodies, Syphilis and Malaria as per the Drugs and Cosmetics Act of 1940 and the rules therein of 1945 amended from time to time⁽⁹⁾.

For the appropriate implementation of blood donation programmes in India, there is a need to know the prevalence of Transfusion Transmissible Infections (TTIs) and the associated risk factors. There is limited data on the various factors responsible for TTIs in many developing countries including India, despite routine screening of all donated blood for infections such as HIV, HBV, HCV, Syphilis and Malaria. Therefore, the present study was conceived to provide an update and insightful information regarding various factors responsible for Transfusion Transmitted Infections (TTIs) among reactive blood donors in a Blood Centre of Himachal Pradesh (H. P.).

2. Materials and Methods

Methodology

It was an institutional based study with retrospective data analysis from "Seroreactive donor notification and recall register" at Blood Centre, Dr Rajendra Prasad Government

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Medical College (Dr RPGMC) Kangra at Tanda. The data of past 90 months (October 2015 to March 2023) was accessed and the number of donors found to be reactive for various diseases like HIV, Viral Hepatitis B and Hepatitis C, Syphilis and who reported on recall and were counselled and referred for further management were noted. The information related to demographic details such as age, gender and occupation, donor status (voluntary donor, family donor, replacement donor), donation status (first time or repeat donation) was recorded. In addition to this, details of history that could be possible factors responsible for transfusion transmitted diseases (TTIs) was also noted from the “ Donor counselling, consent and referral forms” of donors who reported on recall at that time and were counselled and referred for further management.

Data analysis

Data collected was coded and then entered in Microsoft - excel spreadsheet and analysed using SPSS version 24. Various characteristics of blood donors found to be positive for TTIs like age, gender, occupation, donor status and donation status were analyzed and the distribution of patients was presented using frequencies and percentages and difference between the groups was assessed using Chi square (X^2) test. The statistical significance was also conducted amongst the reasons of acquiring the infections. A two - tailed $p < 0.05$ was considered significant.

Ethical permission

Ethical clearance for the study was obtained from the Institutional Ethics Committee of Dr Rajendra Prasad Government Medical College (Dr RPGMC) Kangra at Tanda, Himachal Pradesh, India.

3. Results

Our study included 182 study participants, out of which 179 (98.4%) were males. 88 (48.5%) of responders were of age group 30 - 45 years, 66 (36.3%) were upto 30 years and 28 (15.4%) were above 45 years. Study participants with occupation other than medical personnel, students, drivers and homemakers were 140 (76.9%). This category included shopkeepers, businessman, labourers, painters, ex - army personnel etc. Of the total study participants, 91 (50.0%) were voluntary donors and 90 (49.5%) were first time donors. The difference between various groups among age, gender and occupation has been found to be statistically significant ($p < 0.05$) (Table 1).

Table 1: Distribution of study participants based on age, gender, occupation and type of donor and their association (n=182)

Characteristics	N (%)	p value
Age (years)	Upto 30	66 (36.3)
	31 - 45	88 (48.4)
	Above 45	28 (15.4)
Gender	Male	179 (98.4)
	Female	3 (1.6)
Occupation	Medical personnel	6 (3.3)
	Student	23 (12.6)
	Driver	11 (6.1)
	Home maker	2 (1.1)
	Others	140 (76.9)
Donor status	VD	91 (50.0)
	RD	69 (37.9)
	FD	22 (12.1)
Donation status	First	90 (49.5)
	Repeat	92 (50.5)

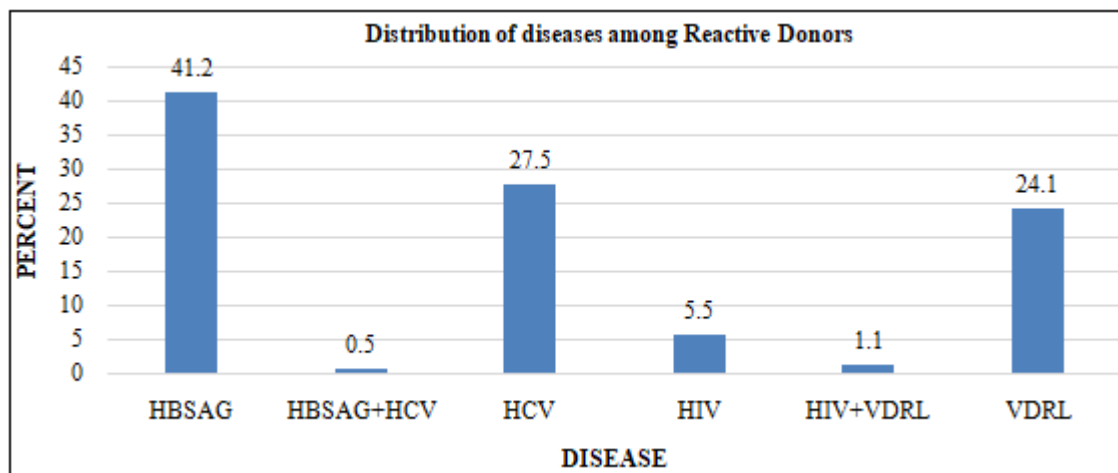


Figure 1: Distribution of various Transfusion Transmitted Infections (TTIs) among the study participants.

Among the study participants, Transfusion Transmitted Infections (TTIs), HBsAg (41.2%) has been found to be most common followed by HCV (27.5%) and VDRL (24.1%) (Figure 1). When analysing association of TTIs with factors based on history, it was observed that the previous history of jaundice in self and IV drug abuse was statistically associated with TTIs ($p < 0.05$) (Table 2). There

was history of jaundice in close family in 8.8%, history of surgery in past in 13.2% and history of probable sharing blades in 17.5% of the study participants. History of blood transfusion, injections for treatment and multiple sex partners/unsafe sex was present in 0.5%, 10.4% and 13.7% respectively (Table 2).

Table 2: Distribution and association of Transfusion Transmitted Infections (TTIs) with factors based on history

History	TTIs (HIV, VDRL, HBsAg or HCV)		p value
	Yes, N (%)	No, N (%)	
Jaundice (in self)	31 (17.1)	151 (82.9)	0.01
Jaundice (in family/close contact)	16 (8.8)	164 (91.2)	0.24
Surgery >1 year ago	24 (13.2)	158 (86.8)	0.82
Sharing blades	32 (17.5)	150 (82.5)	0.51
Blood transfusion >1 year ago	1 (0.5)	181 (99.5)	0.92
IV drug abuse	12 (6.6)	170 (93.4)	0.001
Injection for treatment	19 (10.4)	163 (89.6)	0.32
Tattoo (years)	1 - 5	11 (6.1)	0.45
	above 5	16 (8.8)	
Ear piercing (years)	1 - 5	10 (5.5)	0.90
	above 5	11 (6.1)	
Tissue graft	0	0	-
Multiple sex partners/unsafe sex	25 (13.7)	157 (86.3)	0.30
Earlier information through call/notification post blood donation	10 (5.5)	172 (94.5)	0.76
Prior knowledge of disease due to diagnosis	21 (11.5)	157 (88.5)	0.44

In our study, 5.5% had earlier information by call/notification from Blood centre and 11.5% had prior knowledge about their disease (Table 2). Skin lesions like papules, pustules, pruritic lesions etc were present in 17.7% of VDRL reactive study participants at the time of post donation notification and counselling (Figure 2) and the association was found to be statistically significant (p=0.00).

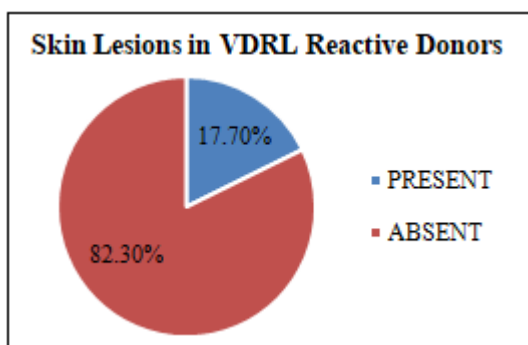


Figure 2: Prevalence of skin lesions in VDRL reactive donors (n=45)

4. Discussion

This retrospective data (secondary) analysis investigated the socio - demographic characteristics (age, gender and occupation), donor status and donation status and determined their association with TTIs. Also, potential factors based on history like jaundice (in self and close family members), transfusion of blood, sharing blades, IV drug abuse, surgery, multiple sex partners and unsafe sex, tattooing etc were analysed for their association with TTIs. In addition to this, distribution of different TTIs among the reactive blood donors who reported after notification was also assessed.

In our study, out of 182 study participants, 50.0% were voluntary donors, 37.9% were replacement donors and 12.1% were family donors. In a study by Sachdev S et al⁽⁹⁾ 71.4% were voluntary donors and 28.6% were replacement donors. It is hypothesised that there could be a higher test seeking behaviour in our voluntary donors. In our study, 49.5% were first time donors and 50.5% were repeat donors whereas in a study by Mremi A et al⁽¹⁰⁾ 98.0% were first time donors.

In our study, 98.4% were male and 1.6% were female study participants similar to many previous studies with higher male to female ratio⁽¹⁰⁾.

In our study, 36.3% belonged to age upto 30 years whereas in a study by Bartonjo G et al⁽¹¹⁾ 63% was upto 30 years and 71.5% upto 35 years in a study by Mremi A et al⁽¹⁰⁾.

Among the Transfusion Transmitted Infections (TTIs), HBsAg (41.2%) has been found to be most common followed by HCV (27.5%), VDRL (24.1%) and HIV (5.5%). HIV+VDRL was found in 1.15 % and HBsAg +HCV in 0.5% of the study participants. This distribution was observed only among the reactive donors who responded post notification and not all the donors in the blood centre.

In our study, jaundice in self and IV drug abuse was statistically associated with TTIs (p<0.05). In a study by Sachdev S et al⁽⁹⁾ the risk factors for acquiring infections in TTI reactive donors were statistically significant history of high risk behaviour (20.3 %) which included IV drug abuse, unprotected sex or multiple sex partners and long route truck drivers for HIV infection. Also among the HBsAg repeat reactive donors, history of jaundice in themselves, family or close contacts was found in 23.7%. In a study by Sonam et al, 53.7% of responders revealed history of high risk behaviour. In a study by Bartonjo G et al⁽¹¹⁾, married (p=0.0057), had non - formal or just primary education (p=0.0262), had multiple sexual partners (p=0.0144) and in informal occupation (p=0.0176) were at higher risk of HIV positivity. History of blood transfusion/blood products (p=0.0055), being married (p=0.0053) were high risk factors associated with positive Syphilis. Being male (P=0.0479) was a high risk factor to HBV infection. In a study by Chang L et al⁽¹²⁾ the differences in demographic distribution of TTI positive and negative donations regarding age, previous donation history, occupation and education were statistically significant (p < 0.001). The factors mentioned above and marital status had associations with TTIs.

In our study, 5.5% had earlier information either by call or notification and referral from blood centre with probability of disease and 11.5% had prior knowledge about their disease. This was worrisome because most of them had

donated again with an intention to find out their test results. This test seeking behaviour of donors was also found among some who had high risk exposure and was disclosed at the time of post donation counselling that they felt that blood donation was a convenient, reliable and free method to get blood tested. Similar observations were seen in studies by Suchet S et al⁽⁹⁾ and Roshan TM et al⁽¹³⁾. William et al⁽¹⁴⁾ reported that 3.0% of donors donated to find out their HIV status where as Korelitz et al⁽¹⁵⁾ found 5.3% higher prevalence of HIV in test seekers. Studies of Seroreactive donors for HIV and other infectious diseases in past have indicated that such donors do admit overt risk later that should have been a criteria for deferral at the time of blood donor screening⁽¹⁶⁾. Three of our HCV reactive donors, who had been notified, counselled and referred for management to Gastroenterologist, donated again after completion of treatment because they were told by treating physicians that they were completely cured. In post donation counselling of VDRL reactive study participants, 17.7% donors mentioned presence of lesions like papules, pustules, pruritic lesions on skin and this association was found to be statistically significant (p=0.00).

A heavy emphasis should be given to maximize voluntary blood donations so as to minimize the risk of TTIs but at the same time in awareness camps, the hazards of high risk behaviour and blood transfusion transmitted infections should be talked about so as to encourage self deferral in such cases and discourage test seeking behaviour in blood donors. Kaur G et al⁽¹⁷⁾ has stated that a blood donor without any underlying motive is essential to maintain safety of blood. Extensive information, education about modes of acquiring these TTIs as part of blood donor motivation, recruitment and retention activity on mass public scale will serve as mode of primary prevention by raising awareness and reducing the risks.

5. Strength and Limitation of Study

Our study was a novel study which had not been conducted in the past under similar settings. It was a secondary data analysis done on the records available which might be subjected to incomplete data and we were not able to have information regarding other socio demographic parameters of patients like region of residence, marital status, education, duration of disease etc. The present study was unable to provide exhaustive information on many other factors responsible for the TTIs which may have influenced our results. Study with better study design and adequate sample size should be carried out in future for assessing the risk factors for TTIs, for more reliable estimates.

6. Conclusion

Jaundice in self and IV drug abuse was statistically associated with TTIs (p<0.05) and skin infections with VDRL (p=0.00). There is need for better counselling practices, and the need for privacy during blood donor selection in blood centre and in outdoor camps. Test seeking behaviour in donors should be discouraged. Proper counselling post donation and at the time of notification is emphasised upon informing donors the provision of confidential unit exclusion (CUE), criteria for permanent deferral, methods of

prevention of transmission of disease and encouraging testing of partners and children.

Conflicts of Interest: None declared

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References

- [1] Stokx J, Gillet P, De Weggheleire A et al. Seroprevalence of transfusion - transmissible infections and evaluation of the pre - donation screening performance at the Provincial Hospital of Tete, Mozambique. *BMC Infect Dis.* May 2011; 11: 141.
- [2] Stramer SL, Glynn SA, Kleinman SH et al. Detection of HIV - 1 and HCV infections among antibody - negative blood donors by nucleic acid - amplification testing. *N Engl J Med.* Aug2004; 351 (8): 760 - 8.
- [3] Mosley JW, Operskalski EA, Tobler LH et al. Viral and host factors in early hepatitis C virus infection. *Hepatology.* July 2005; 42 (1): 86 - 92.
- [4] Perez P, Salmi LR, Folle'a G et al. Determinants of transfusion associated bacterial contamination: results of the French BACTHEM Case - Control Study. *Transfusion.* July 2001; 41 (7): 862 - 72.
- [5] Kitchen AD, Chiodini PL. Malaria and blood transfusion. *Vox Sang.* Feb2006; 90 (2): 77 - 84.
- [6] Herwaldt BL, Linden JV, Bosserman E et al. Transfusion - associated babesiosis in the United States: a description of cases. *Ann Intern Med.* Oct2011; 155 (8): 509 - 19.
- [7] Choudhury LP, Tetali S. Notification of transfusion transmitted infection. *Indian J Med Ethics.* 2008; 5: 58 - 60.
- [8] Miller R, Hewitt PE, Warwick R et al. Review of counselling in a transfusion service: the London (UK) experience. *Vox Sang.* 1998; 74: 133 - 139.
- [9] Sachdev S, Mittal K, Patidar G et al. Risk Factors for Transfusion Transmissible Infections Elicited on Post Donation Counselling in Blood Donors: Need to Strengthen Pre - donation Counselling. *Indian J Hematol Blood Transfus.* Sept 2015; 31 (3): 378 - 384.
- [10] Mremi A, Yahaya JJ, Nyindo M et al. Transfusion - Transmitted Infections and associated risk factors at the Northern Zone Blood Transfusion Center in Tanzania: A study of blood donors between 2017 and 2019. *PLoS ONE.* March 2021; 16 (3): e0249061.
- [11] Bartonjo G, Oundo J, Ng'ang'a Z. Prevalence and associated risk factors of transfusion transmissible infections among blood donors at Regional Blood Transfusion Center Nakuru and Tenwek Mission Hospital, Kenya. *The Pan African Medical Journal.* 2019; 34: 31.
- [12] Chang L, Zhao J, Guo F et al. Demographic characteristics of transfusion transmitted infections among blood donors in China. *BMC Infectious Diseases.* 2019; 19: 514.
- [13] Roshan TM, Rosline H, Ahmed SA et al. Response rate of Malaysian blood donors with reactive screening test to transfusion medicine unit calls. *Southeast Asian J Trop Med Public Health.* 2009; 40: 1315 - 1321.

- [14] William AE, Thomson RA. Estimates of infectious disease risk factors in US donors JAMA 1997; 277: 967 - 72.
- [15] Korelitz JJ, Busch MP. Antigen testing for human immunodeficiency virus (HIV) and the magnet effect: Will the benefit of new HIV test be offset by the numbers of higher risk test seeking donors attracted to blood centres Transfusion 2006; 1: 174 - 9.
- [16] Petersen LR, Doll LS. HIV Blood Donor Study Group. Human immunodeficiency virus type 1 - infected blood donors: epidemiologic, laboratory, and donation characteristics. Transfusion.1991; 31: 698 - 703.
- [17] Kaur G, Kaur P, Basu S et al. Donor notification and counseling: experience and challenges. Transfus Apheres Sci.2013; 49: 291 - 294.