ORIGINAL ARTICLE

Sero-prevalence and Changing Trends of Transfusion Transmitted Infections among Blood Donors in a Tertiary Care Hospital

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Abstract | Introduction | Methodology | Results | Conclusion | References | Citation | Tables / Figures

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Abstract

Background: Safe blood is a critical component in improving health care and in preventing the spread of infectious disease. But the quality and safety of blood transfusion is still a concern for health-care personnel's. We analyzed the sero-prevalence and changing trends of transfusion transmitted infections (TTIs) among blood donors in a tertiary care hospital. **Objectives**: This retrospective study aimed to analyze the percentage of voluntary and replacement blood donors and to know the sero-prevalence and changing trends of TTIs among blood donors in a tertiary care hospital. **Methods**: Blood donations collected over a 6-year period were studied for the type of donation (voluntary or replacement), number of sero reactive cases. Samples were screened for anti HIV 1 & 2, HBsAg, anti HCV, syphilis and malaria. All reactive samples were retested before being labeled as seropositive. **Results**: Of the 187575 donors, 134391 (71.6%) were replacement and 53184 (28.4%) voluntary donors .Of all the blood donors there were 8577 (4.57%) sero reactive cases which included 492 (0.26%) of anti HIV 1&2 , 1937 (1.03%) of HBsAg, 2867 (1.53%) of anti HCV, 3270 (1.74%) of syphilis and 11 (0.006%) of malaria. The overall sero positivity for various TTIs are more in replacement donor i.e. (3.8%), where as it was only (0.7%) among voluntary blood donors and this was statistically significant ($p<0.05$). **Conclusion**: Voluntary donations are safer as compared with replacement ones and need to be encouraged. The screening of blood donors is the corner stone in assuring the safety of blood transfusion.

Key Words

Sero prevalence - HIV; HBsAg; HCV; Blood donors

Introduction

Blood transfusion provides an essential and life-saving support in modern health care, when used appropriately it saves lives. However it can cause acute or delayed complications and also carries the risk of transfusion transmitted infections such as Human Immunodeficiency virus – 1, 2 (HIV-1, 2), Hepatitis B and C, syphilis and Malaria. Blood safety status in India is challenging task with a population of more than 1.25 billion, including more than 2.5 million, 15 million, 43 million cases of HIV, HCV and HBV. (1,2) with a high sero prevalence of anti HIV (0.5%), anti HCV (0.4%) and HBsAg (1.4%) respectively, (3) compared to 0.0097, 0.3 and 0.07 percent in the US blood donors. (4)

Transfusion transmitted infections (TTIs) are a great concern because magnitude of the TTIs varies from country to country depending on TTIs load in that particular population. Multiple measures are taken to minimize TTIs transmission in the Indian population by NACO. (5) The majorities of the problems are due to the prevalence of asymptomatic carriers in the society, as well as blood donations during the window period of infections also poses a great threat to safe blood supply. (6) For a safe blood supply in our country, where comprehensive laboratory tests are neither possible nor pragmatic,

it is best to switch over to 100% voluntary donations. The key to recruiting and retaining safe blood donors is good epidemiological data on the prevalence of infectious markers in the general population to identify low-risk donor populations coupled with an effective donor education, motivation, and recruitment strategy to recruit new voluntary non remunerated blood donors from populations. Despite the current practice of screening blood with Enzyme Linked Immuno Sorbent Assay, a considerable residual risk of transfusion transmission of these virus remains. Although the more sensitive serological tests have shortened the pre-seroconversion window period, they still are not able to identify a number of newly infected blood donors. This technologic limitation puts recipients at a tangible, albeit infrequent risk for transmissible disease. Since viremia precedes sero conversion by several days in case of HIV and several weeks for hepatitis B and C virus, test that detect viral nucleic acid are considered a significant step in our quest to achieve the goal of zero risk for blood transfusion recipients. Nucleic Acid Amplification test (NAT) had the potential to detect viremia earlier than current screening methods which are based on sero conversion. (7)

Aims & Objectives

This retrospective study aimed to analyze the percentage of voluntary and replacement blood donors and to know the sero-prevalence and changing trends of TTIs among blood donors in a tertiary care hospital. It was done because the prevalence of these disease among blood donor also reflect the apparent as well as hidden load in the population as blood donors are usually a part of the society.

Material and Methods

Study design: All voluntary and replacement blood donors donating in the Dept. of Immuno haematology and Blood Transfusion, Dayanand Medical College & Hospital, Ludhiana Punjab, between January 2008 to December 2013 were included in the study. Donors were carefully screened by trained personnel after a complete physical examination and satisfactorily answering the donor's questionnaire. Replacement donors were those who donated blood in exchange for receiving blood units for their patients. Voluntary blood donors donated blood without incentive for the cause. Majority donors belonged to age group 18-65 years. Written consent was also taken from them prior to donation.

Donor Samples studies: From January 2008 to December 2013, a total of 187575 blood donor's samples were tested by routine serological screening for anti HIV 1-2, P24 antigen, anti HCV and Hepatitis B surface antigen by Biomerieux. (Vironostika® HIV Ag-Ab, Hepanostika® HCV Ultra and HBsAg ultra, France). VDRL by Immuno Chromatography card method (Beacon Diagnostic) and Malaria by Rapid one step malaria LDH test (Microgene).

Statistics: Statistical analyses of the overall seropositivity for various TTIs in replacement and voluntary blood donors were compared using the chi-square test. $P<0.05$ was considered to be significant.

Results

A total of 187575 blood units were collected from healthy blood donors over the six year period which include 134391 (71.6%) were replacement and 53184 (28.4%) were voluntary donors. Out of replacement blood donors 131563 (97.9%) were male and 2828 (2.1%) were female and in voluntary 47241 (88.8%) were male and 5943 (11.2%) were female [Table 1]. There was slight change in the trend of blood donation, with an increase in voluntary blood donors from 14.2% to 36.5%. Of all the blood donors there were 8577 (4.57%) sero reactive cases which included 492 (0.26%) of anti HIV, 1937 (1.03%) of HBsAg, 2867 (1.53%) of anti HCV, 3270 (1.74%) of syphilis and 11 (0.006%) of malaria. Out of 134391 replacement blood donors, 433 (0.23%) were seropositive for anti HIV, 1617 (0.86%) for HBsAg, 2394 (1.28%) for anti HCV, 2777 (1.48%) for syphilis and 9 (0.005%) for malaria. Of 53184 voluntary blood donors, 59 (0.03%) were seropositive for anti HIV, 320 (0.17%) for HBsAg, 473 (0.25%) for anti HCV, 493 (0.26%) for syphilis and 2 (0.001%) for malaria. The overall sero positivity for various TTIs are more in replacement donor i.e. (3.8%), where as it was only (0.7%) among voluntary blood donors and this was statistically significant ($p<0.05$).The characteristic distributions of sero-reactivity in voluntary and replacement donors are shown in [Table 2].

Discussion

Acquisition of TTIs by blood transfusion is a major global health challenge in transfusion medicine; therefore no effort should be spared at reducing this complication to minimum level. Stringent screening

of blood donors for TTIs infections is crucial to ensure safe supply of blood and blood products. With every unit of blood and blood product, there is a 1% chance of a transfusion associated problems including TTIs. Moreover, it should never be forgotten that blood collected in the window period of infection may be infectious despite a negative serological test (8).In recent years there has been a special interest in donor selection strategies in blood banks in order to provide safer blood supply but there is no screening method to reduce the risk of TTIs to zero. The prevalence of TTIs among blood donors in well-structured health care system with a well-organized blood bank can be used as a reliable tool for statistical estimations of those infectious agents that can be transmitted through blood and products and can contribute to statistical estimation of these infections in the general population. (9)

In our study replacement blood donors are predominant, in whom all infections were found to be more prevalent. Many studies have estimated the prevalence of TTIs in voluntary and replacement donors across India as shown in [Table 3]. All studies have shown that replacement donors have higher seroreactivity rates than voluntary donors. (10,11,12,13,14) It can be due to number of factors including concealing high risk behavior and professional donors posing as relatives. (15) The overall prevalence of anti HIV, HBsAg, Anti HCV, VDRL and Malaria during the period under study was 0.26, 1.03, 1.53, 1.74 and 0.006% respectively. The prevalence of anti HCV and VDRL is higher in our study, although the yearly prevalence shows a slight downward trend. Female made a smaller section of the study as they were found to be anemic and did not fulfill the required fitness criteria. Efforts should be made to improve the number of female donors by increasing awareness among female population and holding camps in women's colleges.

We found higher prevalence of anti HCV and VDRL in both voluntary and replacement donors as compared to other studies. It may be due to variation in the population or increased burden of infection in the society. In our study HCV sero positivity was 1.53%. HCV infection is a major cause of post-transfusion hepatitis in India with a prevalence of around 1% in the population. (16) A study in Delhi has reported HCV in blood donors as 0.66% to 2.5% and in western India 0.28% respectively. (10,17) High prevalence of 6% HCV infection was reported by another study in Hyderabad. (18) Occult HBV infection can exist in the absence of HBsAg and can be detected by determining HBV DNA. Vertical transmission in India is found to be infrequent with genotypes A and D. HBsAg negative units have been found to transmit HBV infections. (19,20,21) Due to a similarity in risk factors and transmission, promotion of regular voluntary blood donation can minimize the risk of TTIs in accordance with the National blood Policy. However, due to low socio economic status, lack of public awareness and education would go a long way in curbing the prevalence of these infections and increasing blood safety.

Conclusion

Voluntary donations are safer as compared to replacement and should be encouraged but transmission of TTIs during serologically negative window period, occult infection still poses a threat to blood donor's safety. Apart from recruiting new donors, measures should be taken to retain previous donors.

With this prevalence of TTI's, pit falls in detection methods and the morbidity and mortality associated with TTI's, we have to urgently consider the need to modulate and adopt newer sensitive technologies. Stringent measures need to be taken for blood donor screening, by using more sensitive methods to detect infection early, like Nucleic acid testing assays.

Recommendation

TTI in blood donors project the infection in society.

Relevance of the study

To highlight the importance of transfusion transmitted infections in healthy blood donors.

Authors Contribution

All author had contributed equally in writing the manuscript, editing, collection of data and compiling.

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Tables

TABLE 1YEARLY DISTRIBUTION OF VOLUNTARY AND REPLACEMENT BLOOD DONORS WITH GENDER

Year	Total Donation	Voluntary (%)	Male (%)	Female (%)	Replacement (%)	Male (%)	Female (%)
2008	30880	4375(14.2)	4001(12.9)	374(1.2)	26505(85.8)	26331(85.2)	174(0.6)
2009	29234	6727(23.0)	5858(20.0)	869(3.0)	22507(77.0)	22215(76.0)	292(1.0)
2010	34544	8758(25.4)	8098(23.4)	660(1.9)	25786(74.6)	25263(73.1)	523(1.5)
2011	32015	9215(28.8)	7989(24.9)	1226(3.8)	22800(71.2)	22041(68.8)	759(2.4)
2012	30804	13102(42.5)	11525(37.4)	1577(5.1)	17702(57.4)	17083(55.4)	619(2.0)
2013	30098	11007(36.5)	9770(32.4)	1237(4.1)	19091(63.4)	18630(61.9)	461(1.5)
Total	187575	53184	47241(88.8)	5943(11.2)	134391	131563(97.9)	2828(2.1)

TABLE 2CHARACTERISTICS DISTRIBUTION OF SEROREACTIVITY IN VOLUNTARY AND REPLACEMENT DONORS

Year	HIV		HBV		HCV		VDRL		MP	
	V*	R**	V	R	V	R	V	R	V	R
2008	1	78	25	244	41	540	65	614	0	1
2009	13	63	46	288	60	411	68	594	2	2
2010	8	67	50	292	78	525	78	550	0	2
2011	12	103	69	402	101	336	87	395	0	0
2012	13	76	78	195	99	333	101	303	0	3
2013	12	46	52	196	94	249	94	321	0	1
Total (%)	59(0.03)	433(0.23)	320(0.17)	1617(0.86)	473(0.25)	2394(1.28)	493(0.26)	2777(1.48)	2(0.001)	9(0.005)
8577(4.57)	492(0.26)		1937(1.03)		2867(1.53)		3270(1.74)		11(0.006)	

*HIV – Human Immunodeficiency Virus, HBV – Hepatitis B Virus, HCV – Hepatitis C Virus, MP - Malarial Parasite, VDRL- Venereal Disease Research Laboratory * – Voluntary donors ** – Replacement donors*

TABLE 3 COMPARISON OF TTIS IN VARIOUS STUDIES FROM INDIA:

	HIV (%)		HBs Ag (%)		HCV (%)		VDRL (%)		MP (%)	
	V*	R**	V	R	V	R	V	R	V	R
Garg *et al*10 Western Region (1994-98)	0.27	0.46	2.57	3.53	0.0	0.32	0.13 -	0.24	-	-
Singh *et al*11 Delhi (1997-99)	0.8	0.8	1.2	1.9	1.3	3.0	-	-	-	-
Sharma *et al*12 Chd (1997-2002)	0.32	0.45	0.91	1.26	0.23	0.52	0.26	0.57	-	-
Gagan *et al*13 Chd (2001-2005)	0.15	0.44	0.65	1.07	0.3	0.5	0.14	0.48	-	-
Negi *et al* 14 Uttarakhand (2000-2010)	0.05	0.23	0.21	1.06	0.20	0.78	0.04	0.39	0.000	0.005
Jasmin *et al*15 Piparia (2006-2011)	0.0	0.25	0.1	1.2	0.0	0.15	0.1	0.7	-	-
Our Study (2008-2013)	0.03	0.23	0.17	0.86	0.25	1.28	0.26	1.48	0.001	0.005

*HIV – Human Immunodeficiency Virus, HBV – Hepatitis B Virus, HCV – Hepatitis C Virus, MP - Malarial Parasite, VDRL- Venereal Disease Research Laboratory * – Voluntary donors ** – Replacement donors*