ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Prevalence of Hepatitis B Virus, Hepatitis C Virus and Human Immunodeficiency Virus Is and Around Gulbarga: A Hospital Blood Bank Based 10 Year Study

Zeenath Begum[1]*, Mohammed Abdul Lateef[2], Gaffar Shaik[1], and Shagufta Ruhi[3]

[1] KBN HOSPITAL Gulbarga 585102, Karnataka, India.
[2]Technical Supervisor, KBN Blood Bank, Gulbarga 585102, Karnataka, India.
[3] Blood Bank Officer, KBN Blood Bank, Gulbarga 585102, Karnataka, India.

ABSTRACT

The main blood borne viruses 'viz. hepatitis B virus (HBV), human immunodeficiency virus (HIV), and hepatitis C virus (HCV), are a major public health issue, and represent significant causes of morbidity and mortality associated with transfusion. This studies the trends of blood borne infections among blood donors in a blood bank in the last 10 years.Viral screening result of 7,066 voluntary and replacement donations from 2003 to 2012 were analyzed. All donations were screened for HBV, HCV, and HIV. The sero prevalence rate of HBV, HCV and HIV infections and 95% confidence interval were calculated.The seroparevalence of HBV, HIV and HCV decreased during the last 10 years study 2003 to 2012. There is significant and impressive decrease in HBV serprevalence rate from 2.33% in 2004 to 1.74% in 2012. The seroprevalence rate of HIV appeared to have decreased with a very significant value from 1.69% in 2003 to 0.28% in 2012. Hepatitis C virus seropraevalence rate showed decline in blood donations from 1.12% in 2003 to 0.18% in 2012.There is a general reduction in the seropreavalence rate of viral infections. This is probably because of discouragement of professional or paid donations; better awareness, prophylactic measures, and availability of vaccines have played a major rote.

Keywords: transfusion transmitted disease, blood banking, blood donation.

Corresponding Author:

ISSN: 0975-8585

INTRODUCTION

Provision of safe blood to the patient is of paramount importance. The main blood borne viruses' viz. hepatitis C virus (HCV) are a major public health issue, and represent significant causes of morbidity and mortality associated with transfusion. This is especially so in the developing countries.[1,2] Major routes of transmission of these viruses are direct contact with blood , intravenous injection, transfusion of blood, and also sexual contact, although the latter is not considered as a major route in the case of HCV and HBV. The current risk of transmission of these transfusion transmitted infections (TTI) by blood transfusions are HBV 1:250,000-1:500,000, HIV 1:2,000,000 and HCV 1:2,000,000 (an American study, 2004 estimate)[3,4], thus, infectious complications of blood transfusion remain an importance area of concern in transfusion medicine.

Study of seroprevalence rate of these viruses in blood donors is an accurate index for understanding their disease trends in the general population. Further more such studies gives us guidance as to what further is to be done in our public education necessity of further improving prophylactic measures including vaccination and nucleic acid testing (NAT). This study analysed the trends and changes in rates of blood borne viral infections among blood donors in the last 10 years (2003-2012) in a blood bank.

MATERIALS AND METHODS

From the existing donor registry, data was collected for analysis in respect of donor number, type of donation (voluntary or replacement), and demographic characteristics (age and educational status). To assess changes in incidence of TTI from 2003 to 2012, screening result on 7,066 voluntary and replacement donations were analyzed.

Voluntary blood donors are the people, who donate their blood without any pressure and monetary benefit, for unknown patients (recipients). While, replacement blood donors are the numbers of family / friends of the patients, who donate their blood in replacement of the blood needs of the particular patients. Replacement donation is a common practice in our country. Repeat blood donors are included in voluntary donation but there is at least three months interval in between.

All donations (voluntary and replacement) were screened mandatorily for hepatitis B surface antigen (HBsAg), anti-HCV antibody, anti HIV one and two antibodies, malarial parasites, and treponemal antibodies, using food and drug administration (FDA) products were excluded and discarded safely, strictly adhering to FDA regulation. The deferral donor registry was maintained.

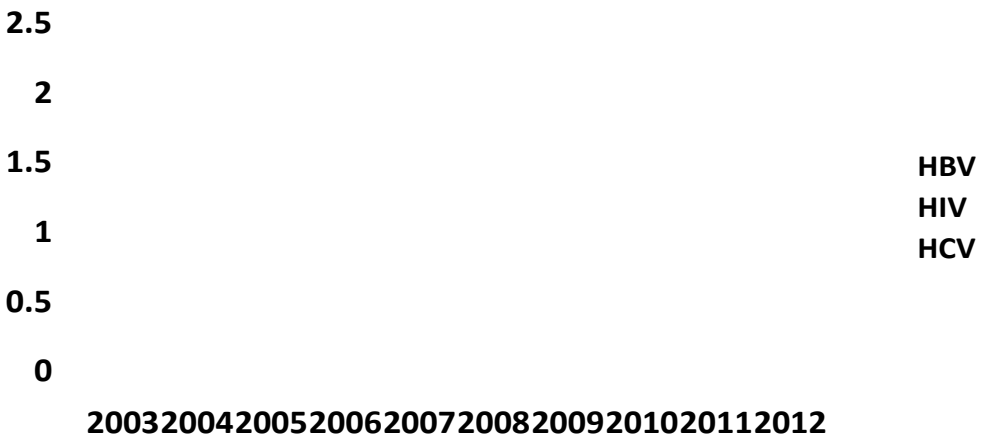
To define the seroprevalence rate of TTI, the number of positive donations was divided by defined number of donations for that year. For assessing frequency and seroprevalence were made in percentages, and 95% confidence this study data was analysed by using test and result were considered significant if P value was < 0.05.

ISSN: 0975-8585

RESULTS

The data collected from our blood donation centre showed that a total of 7066 donations were tested in screening laboratory during the 10 year period from 2003 through 2013, where 92.9% where voluntary, and 7.1% were replacement. It was noteworthy that a large percentage of donors were educated: 57% had a minimum high school certificate. There is gradual increase in number of non remunerated voluntary donations over the years and also the seroprevalence rate of TTI is low in this group in comparison the replacement donors.[7,9] The majority of donors were men (98%) and 57% among men were between 20 years and 39 years of age. A significant decrease in seroprevalence rate of TTI (HBV,HCV,and HIV) is observed in the last 10 years (from 2004 to 2012). Seroprevalence rate of these TTI in younger age group (20-39 years) is more in 2003 and 2012. These observations were in general in agreement with several studies done across the globe.

The overall seroprevalence rate of HBV in 7066 donations in last decade was 1.7 4%, which showed a decline from 2.33 % in 2004 to 1.7 % in 2012 ($p<0.00001$; Table 1 and graph1). The overall seroprevalence rate f HIV infection in last decade was 0.28 %. It had a decline with a very significant value from 1.69% in 2003 to 0.28% in 2013 ($P<0.000001$;Table 1 and graph 1). The overall seroprevalence rate of anti-HCV during the study period in 7066 donations in last decade was 0.18%. It showed a steadily decline from 1.12% in 2003 to 0.18% in 2012, which is however not statistically significant ($P<0.05$; Table 1 and graph 1). In the central database, data of 177 donations in 2003 and 2012 of 2123 donations were analysed.



Graph 1. Seroprevalence reate of hepatitis B virus, human immunodeficiency virus, and hepatitis C virus infections between 2003 and 2013.

The seroprevalence rate for HBsAg decreased in both voluntary and replacement donations. The seroprevalence rate decreased from 2004 to 2012 in all age groups ($P<0.00001$;Table 2). In comparison, from 2004 to 2012, the frequency of HIV in voluntary donations was significantly less than replacement donations ($P<0.000001$;Table3). Anti-HCV showed a steady decline from 2003 to 2013 in both voluntary and replacement donations ($P=0.05$;Table4).

ISSN: 0975-8585

Table 1 Seroprevalence reate of hepatitis B virus, human immunodeficiency virus, and hepatitis C virus infections between 2003 and 2013.

		HBV		HIV		HCV	
Year	Total donations	Infections (%)	95% CI	Infections (%)	95% CI	Infections (%)	95% CI
2003	177	(2)1.12	2.0-2.7	(3)1.69	0.2-3.5	(2)1.12	2-2.7
2004	343	(8)2.33	0.7-3.9	(0)nil	0	(2)0.58	0.2-1.3
2005	265	(5)1.88	0.2-3.5	(1)0.37	0.36-1.1	(0)nil	0
2006	348	(5)1.43	0.8-2.6	(0)nil	0	(2)0.57	0.2-1.3
2007	238	(3)1.26	0.1-2.6	(2)0.84	0.32-2	(0)nil	0
2008	525	(8)1.52	0.4-2.5	(0)nil	0	(0)nil	0
2009	905	(11)1.21	0.5-1.9	(1)0.01	.06-0.08	(0)nil	0
2010	965	(15)1.55	0.7-2.3	(3)0.31	0.04-0.6	(0)nil	0
2011	1177	(20)1.69	0.9-2.4	(0)nil	0	(5)0.42	0.05-0.7
2012	2123	(37)1.74	1.18-2.3	(6)0.28	0.06-0.5	(4)0.18	0-0.36
Total	7066	(114)1.61	0.8-2.4	(16)0.22	0.05-0.5	(15)0.21	0.05-0.5

CI: confidence interval, HBV: hepatitis B Virus, HCV: hepatitis C virus, HIV: human immunodeficiency virus.

Table 2: Seroprevalence rate of hepatitis B virus in different donations status and age groups between 2003 and 2012.

	2003				2013			
Markers	Donations	Positive	Seroprealence rate (%)	95% CI	Donations	Positive	Seropreale nce rate (%)	95% CI
Status of donation								
Voluntary	119	1	0.84	0.8-2.4	2084	35	1.67	1.12-2.2
Replacement	58	1	1.72	1.63-5	39	02	5.12	1.8-1.4
Total	177	2	1.12	0.4-2.6	2123	37	1.74	1.1-2.3
Age groups (yr)								
<19	20	nil	0	0	127	nil	0	0
20-29	102	nil	0	0	1210	23	1.90	1.1-2.6
30-39	40	1	2.5	2.3-7.3	580	11	1.89	0.7-3
40-49	9	nil	0	0	176	3	1.70	0.2-3.6
>50	6	1	16.6	13.1-46.	30	nil	o	0
Total	177	2	1.12	0.4-2.6	2123	37	1.74	1.1-2.3

CI: confidence interval.

Table 3: Seroprevalence rate of human immunodeficiency virus in different donations status and age groups between 2003 and 2013.

	2003				2012			
Markers	Donations	Positive	Seroprealence rate (%)	95% CI	Donations	Positive	Seroprealence rate (%)	95% CI
Status of donation								
Voluntary	119	2	1.68	0.6-3.9	2084	5	0.23	0.02-0.44
Replacement	58	1	1.72	1.63-5	39	1	2.5	2.5-7.4
Total	177	3	1.69	0.2-3.5	2123	6	0.28	.06-0.5
Age groups (yr)								
<19	20	nil	0	0	127	nil	0	0
20-29	102	2	1.96	0.7-4.6	1210	4	0.33	0.01-0.6
30-39	40	1	2.5	2.3-7.3	580	1	0.17	0.17-0.5
40-49	9	nil	0	0	176	1	0.56	0.5-1.6
>50	6	nil	0	0	30	nil	0	0
Total	177	3	1.69	0.2-3,5	2123	06	0.28	0.06-0.5

CI: confidence interval.

ISSN: 0975-8585

Table 4: Seroprevalence rate of hepatitis C virus in different donations status and age groups between 2003 and 2013.

	2003				2013			
Markers	Donations	Positive	Seroprealence rate (%)	95% CI	Donations	Positive	Seroprealence rate (%)	95% CI
Status of donation								
Voluntary	119	1	0.84	0.8-2.4	2084	3	0.14	0.02-0.3
Replacement	58	0	0	0	39	1	2.5	2.5-7.4
Total	177	1	0.56	0.5-1.6	2123	4	0.89	0.4-1.2
Age groups (yr)								
<19	20	nil	0	0	127	nil	0	0
20-29	102	1	0.98	0.9-2.8	1210	2	0.16	0.07-0.3
30-39	40	nil	0	0	580	1	0.17	
40-49	9	nil	0	0	176	nil	0	0
>50	6	nil	0	0	30	nil	0	0
Total	177	01	0.98	0.4-2.4	2123	04	0.89	0.4-1.2

CI: confidence interval.

DISCUSSION

Declining trend in seroprevalence rate of TTI is noted in donations from 2003 to 2013; HBV from 2.4 % to 1.2 %, HIV 1.3 % to 0.3 %, HCV 0.4 % to 0.2 %. This declining trend is due to discouragement of professional or paid donations, increased awareness, better screening procedures, and better education in general population. Seroprevalence rate in younger age group (20-39 years is more, compared to elderly in 2003 compared to 2013. this is probably because of indulgence in unsafe practices such as intravenous drug abuse and unsafe sexual activities.

Hepatitis B virus is the most common TTI. There is significant and impressive decrease in hepatitis B seroprevalence rate from 2.4 % to 1.2 %. This is in accordance with other studies, which also show a decrease in seroprevalence rate of HBV in the past decade. However the present seroprevalence rate in the studies of Nanu et al conducted in North India is <2.5 %, [2] in a study of Sarkodie et al conducted in West Afruca us 15 %, [9] and 0.00038 % by Soldan et al conducted in England. [7] This trend is likely to be due to multiple factors which include, increased awareness and better education in general population, better screening procedures, and an active HBV vaccination programme.

Among all the TTI, HIV seroprevalence rate has shown the most significant reduction. Seroprevalence rate of HIV among blood donors has significantly declined from 1.3 % to 0.30 %. This is in accordance with other studies, which also show a decrease in seroprevalence rate of HIV in the past decade. However the present seroprevalence rate in the studies of Nanu et al conducted in North India is 0.55 %, [2] in a study of Sarkodie et al conducted in West Africa is 2.4 %,[9] and 0.000012% by Soldan et al conducted in England. [7] Declining trends are due to increased awareness in general public about the disease and its consequences, modes of spread of the disese, and also better application and acceptance of preventive measures. [4,6]

There was a teady decrease in seroprevalence rate of HCV by transfusion over the last decade from 0.4 % to 0.2 %. This is in accordance with other studies, which also show a decrease in seroprevalence rate of HCV in past decade. However, the present

seroprevalence rate in the studies of Nanu et al conducted in North India is 1.49%, [2] in a study by Sarkodie et al conducted in West Africa it is 0.3 %, [9] and 0.00019 % in a study by Soldan et al conducted in England. [7] This is all probability due to the use of more sophisticated and sensitive screening test.

Overall the public propaganda and awareness measures instituted by the ministry of health have greatly contributed in increasing the general population's knowledge and awareness of blood borne infections, their routes of transmission, and preventive measures. Educational efforts at the blood bank donation centres and at organized blood camps have also played a major role in spreading awareness on TTI. Further increase in the number of voluntary donations will go a long way in substantially reducing TTI. The existence of a data registry of blood donors with history of positive results in blood screening tests is another possible important factor having a role in the observed decline in seroprevalence rate. Finally, the advent of potent vaccines and organized immunization programmes such as, hepatitis B immunization programmes in children, pregnant women and healthcare workers, also play an important role in the declining trends observed in TTI.

The seroprevalence rate of TTI has significantly decreased in the last decade among the blood donors, which is indicative of the effective safety measures that have been taken both in the general population and in the field of transfusion medicine. There is an increased awareness about blood borne infections and their routes of transmission. However, important initiatives are to be taken in the future for taking blood safety to a higher level. These would include, an increase in the activity of voluntary counseling and testing centres, urgent requirement of potent vaccines for HIV and HCV, improving public health programmes with a focus on counseling and screening of those engaged in high-risk activities, and increasing regular voluntary and non remunerated donations.

Better screening methods are required to decrease the window period of TTI. Testing for hepatitis B core antigen, along with the already existing enzyme linked immunosorbent assay (ELISA) tests for detection of hepatitis B surgace antigen will aid in better detection of HBV. The introduction of fourth generation ELISA (where both antigen and antibodies are detected) for the screening tests for HIV will aid in better detection of HIV. Further improved screening methods can be achieved in future by replacement of ELISA by nucleic acid test (NAT), which is a molecular based polymerase chain reaction (PCR) / transcription medicated amplification (TMA) method, in the infectious disease screening protocol in blood banks. Future applications of NAT technology would include expanding testing platforms to enable direct detection of additional viruses and other infectious agents.

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