INTERNATIONAL JOURNAL OF MEDICAL AND APPLIED SCIENCES
E-ISSN:2320-3137

Research Article

TRENDS IN SEROPREVALENCE OF HIV, HEPATITIS B, HEPATITIS-C AND SYPHILIS INFECTIONS AMONG BLOOD DONORS AT TERTIARY HOSPITAL

Mudholkar Vishal G

Department of Pathology, Dr S C Government Medical College & SGGS Hospital, Nanded. PIN-431601, Maharashtra, INDIA.

Corresponding Author: Dr. Mudholkar Vishal G.

ABSTRACT

To determine the prevalence rates of human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV) and syphilis infections among blood donors. 2) To determine the trends in seroprevalence of these infections from January 2001 to December 2010. This retrospective study was conducted at the blood bank of our institute. An analysis of blood donations from January 2001 to December 2010 was done to assess the trends in seroprevalence of HIV (I and II), hepatitis B, hepatitis C and syphilis infections. Enzyme linked immunosorbent assay (ELISA) was used as screening test for detection of antibodies for HIV-I and II for HIV infection, hepatitis B surface antigen (HBsAg) for HBV infection, anti-HCV antibodies for HCV infection and, while, VDRL (RPR) test was used for detection of Trepanoma pallidum of syphilis. Out of 50,383 blood donors analyzed, 38,090 (75.60%) were voluntary donors and 12,293 (24.40%) replacement donors. Overall, positivity rate for infections was 4.4% and mean prevalence rates for HIV, HBV, HCV and syphilis were (581 cases) 1.15%, (1474 cases) 2.90%, (176 cases) 0.33% and (9 cases) 0.018% respectively. Prevalence rate of HBV was highest and that of syphilis was lowest one. Declining trends were observed in all the four infections. Declining trends in the seroprevalence of infections might be the result of more scrutiny in donor selection and improved sensitivity of serological tests. So, formulation of safe blood transfusion policy and implementation of standard screening protocol should be practiced.

KEYWORDS: Blood donors, HIV, hepatitis B, hepatitis C, syphilis, trends in seroprevalence.

INTRODUCTION:

Advances in infectious disease testing have continued to improve the safety of blood supply. Besides the established viral, bacterial and parasitic diseases, novel agents have now appeared, and are still emerging. Thus, infectious complications of blood transfusion continue to be an important area of concern in transfusion medicine. In recent years, numerous infectious agents (found worldwide) have been identified as potential threats to blood supply.[1]

The magnitude of the TTI varies from country to country depending upon TTIs loads in that particular population from where blood units are sourced. Viral infections assume a great importance in transfusion associated mortality and morbidity in patients. Majority of problems are due to prevalence of asymptomatic carriers in the society, as well as, blood donation during the window period of infection. Concealing of medical history by captive, paid or professional donors who widely exist in developing countries, also pose a great threat to safe blood supply. There is long list of viruses, bacteria and parasites, which can be

transmitted through blood transfusion. Among them, important transfusion transmitted infectious agents are Human Immunodeficiency Virus (HIV), Hepatitis B virus (HBV), Hepatitis C virus (HCV), syphilis infection by spirochetes and transfusion associated malaria.

Evaluation of trends in seroprevalence of transfusion transmitted infections (TTI)- HIV, hepatitis B, hepatitis C and syphilis is essential for monitoring blood supply safety and donor screening effectiveness. Strategies that have been used to reduce TTI includes improving donor selection, testing the donated blood for specific antibodies for infectious agents, reducing exposure to allogenic blood by use of autologus transfusion and changing transfusion guidelines to use blood more conservatively. Despite these measures, there is still a residual risk of transmitted infections during the transfusion of blood.[2] This study presents data on the prevalence rates of infectious markers from January 2001 to December 2010 among voluntary and replacement donors in the blood transfusion services at our institutional blood bank.

MATERIAL AND METHODS:

In this retrospective study, a total 50,383 units of blood donations were collected from both voluntary as well as replacement donors at our institutional blood bank from January 2001 to December 2010. Donors were selected for blood donation by the trained personel after a complete physical examination and satisfactory answering of the donor questionnaire. The family members, friends or relatives of patient were catagorized as replacement donors. While, persons donating blood without expecting any favor in return or involuntary blood donation camps were classified as voluntary blood donors.

After collection, all the samples were screened for detection of hepatitis B surface antigen for HBV, anti-HCV antibodies for HCV, anti-HIV (I &II) antibodies for HIV and Treponema pallidum antibodies for syphilis. Enzyme linked immunosorbent assay (ELISA) was used as screening test for detection of HIV, HBV and HCV infection. While, Venereal Disease Reaserch Laboratory (RPR) test was used for detection of Trepanoma pallidum of syphilis. All the reactive samples of HIV (I&II) were repeat tested with western blot before labeling them sero-positive. If any of these were positive, the blood bag was discarded with proper way of disposal. The statistical evaluation of data was made year wise and trends in seroprevalence of HIV, hepatitis B, hepatitis C and syphilis infections was studied over the 10 year period.

RESULTS:

Total number of blood donations over a period of 10 years from January 2001 to December 2010 was 50,383. Of these, 38,090 (75.60%) were voluntary donors and 12,293 (24.40%) were replacement donors. Overall, the number of donations was more during 2004 to 2006, while it was less in the year 2009. (Table No 1) The highest percentage (83.17%) of voluntary blood donation was seen in the year 2008, while, lowest (63.68%) was in 2010.

Table No 1: Year-wise blood donations from January 2001 to December 2010.

YEAR	TOTAL NUMBER OF	VOLUNTARY DONORS		REPLACEMENT DONORS	
		DONORS	PERCENTAGE	DONORS	PERCENTAGE
2001	4648	3588	77.19%	1055	22.81
2002	4854	3700	76.22%	1154	23.78
2003	4079	4079	80.86%	965	19.14
2004	5463	3690	67.54%	1773	32.54
2005	5526	3880	70.21%	1646	29.79
2006	5742	4514	78.61%	1228	21.39
2007	5021	4059	80.84%	962	19.16
2008	4631	3852	83.17%	779	16.83
2009	4246	3408	80.26%	838	19.74
2010	5213	3320	63.68%	1893	36.32
TOTAL	**50,383**	**38,090**	**75.60%**	**12,293**	**24.40**

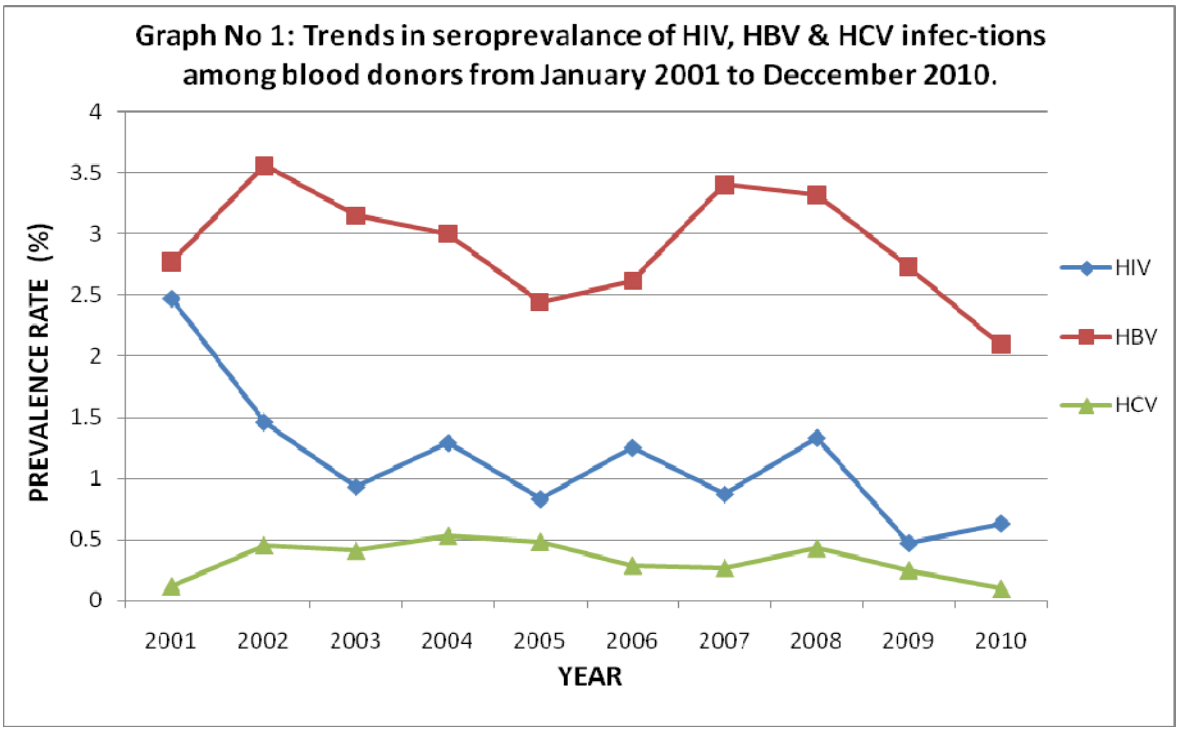
The result of serological tests in our 10 year study revealed overall positivity rate of 4.4% for transfusion transmitted infections. Seroprevalence rate from 2001 to 2010 for HIV was 581 cases (1.15%), for HBs Ag was 1447 cases (2.90%), for HCV was 176 cases (0.34%) and for syphilis was 09 cases (0.018%). (Table No 2)

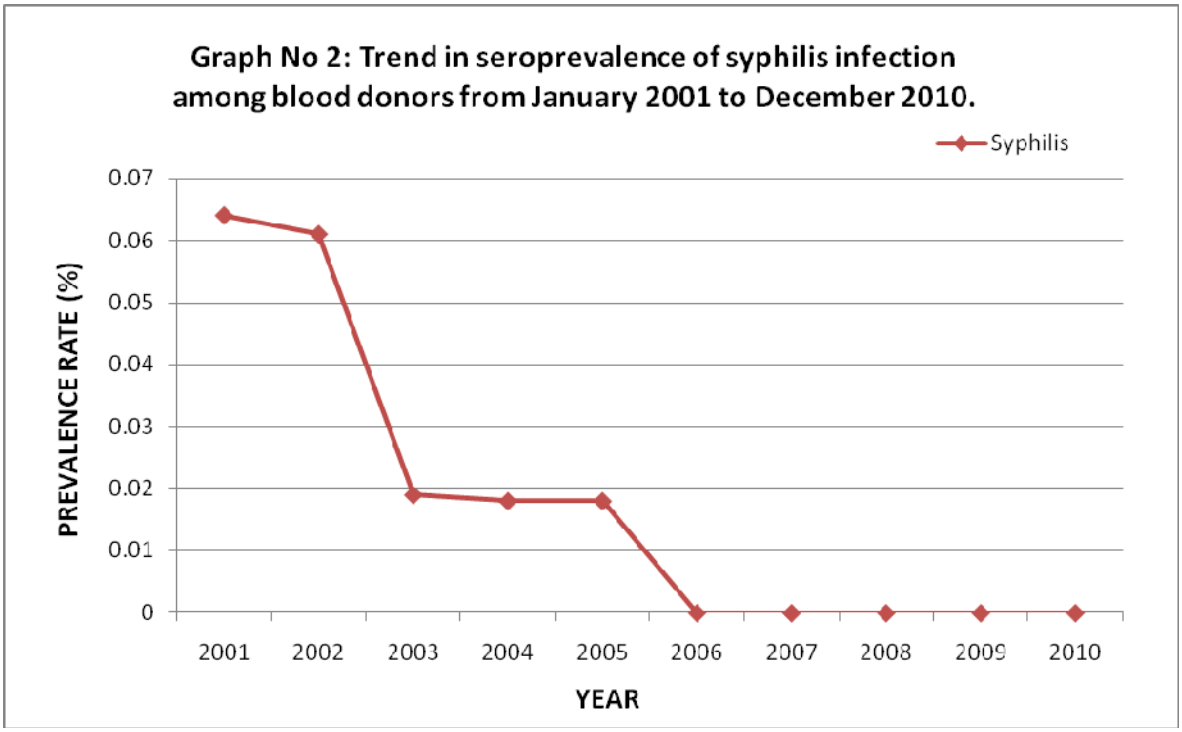
Table No 2: Year-wise prevalence rates of HIV, hepatitis B, hepatitis C and syphilis infections among blood donors from January 2001 to December 2010.

YEAR	HIV		HBV		HCV		SYPHILIS	
	CASES	%	CASES	%	CASES	%	CASES	%
2001	115	2.47	129	2.77	06	0.12	03	0.064
2002	71	1.46	173	3.56	22	0.45	03	0.061
2003	47	0.93	159	3.15	21	0.41	01	0.019
2004	71	1.29	164	3.00	29	0.53	01	0.018
2005	46	0.83	135	2.44	27	0.48	01	0.018
2006	72	1.25	151	2.62	17	0.29	00	00
2007	44	0.87	171	3.40	14	0.27	00	00
2008	62	1.33	154	3.32	20	0.43	00	00
2009	20	0.47	116	2.73	11	0.25	00	00
2010	33	0.63	109	2.09	09	0.10	00	00
TOTA	**581**	**----**	**1474**	**----**	**176**	**----**	**09**	**----**

The trend in seroprevalence rate for all the four infections –HIV, HBV, HCV and syphilis infections was declining in our study from 2001 to 2010. Trend in HIV seroprevalence was

declining with highest number of cases (115) in the year 2001. (Graph No 1) Trend for HBV infection was declining from 2001 to 2006, followed by increase in 2007 and 2008 and again decline upto 2010. The highest numbers of positive cases (173) was in the year 2002. Trend in HCV infection was also declining with highest number (29) of cases in 2004. Trend in syphilis infection was declining with highest number (3) of cases in 2001. There was not a single positive case from 2006 to 2010 (Graph No 2).





.DISCUSSION:

There are important potential public benefits to screen blood donors for early diagnosis and treatment of hepatitis B, hepatitis C, HIV and syphilis infections. The risk of transfusion transmitted infections has declined dramatically in high income nations over the past two decades, primarily because of extraordinary success in preventing HIV and other established transfusion transmitted viruses from entering the blood supply. [3]

In our study, 50,393 blood donors were analyzed from January 2001 to December 2010 after screening the donors using a standard interview, physical examination and history for high risk behaviors. Of these, 38,090(75.60%) were voluntary donors and 12,293 (24.40%) were replacement donors (Table No 1). The number of donation was more during 2004 to 2006 and in 2010, while it was less in the year 2009.

In the study by Gupta PK *et al*, the voluntary donors were 61.90% and replacement donors were 38.10%.[4] In our 10 year study, the mean prevalence rate was highest for HBV (2.90%) and lowest was for syphilis (0.018%) among the four infections studied. Similar findings were observed in the study by Gupta PK *et al*.[4]

1) Human Immunodeficiency Virus:

In our study of 10 years, the prevalence rate for HIV infection among blood donors ranged from 0.47% to 2.47% with mean of 1.15%. Initially, in 2001, it was found to be 2.47%, the seroprevalence then went on declining over the 10 year period to reach 0.63% in 2010. The highest prevalence rate of HIV was seen in 2001 and lowest one was in 2009. From the year 2001 to 2007, the number of blood donations were increased, however, the proportion of HIV positive cases detected was consistently decreasing (Graph No 1). In 2008 and 2009, though donations were slightly reduced, the prevalence rate was further declined to 0.47%.This decline must be due to strict donor selection criteria and improved sensitivity of the testing. This reduced prevalence rate indicates significant progress towards the recruitment of a safer donor population in a developing country despite a major HIV and AIDS epidemic in general population. In the study by Choudhury *et al*, HIV incidence was found to be 8.2%.[5] HIV incidence among antenatal clinic attendees and HIV seroreactivity among blood donors reflect the prevalence of HIV in general population.[6] In the study by Deshpande M *et al*, the prevalence rate of HIV positivity was 1.33% in 2000 and 1.22% in 2001 among the blood donors in Mumbai.[7]

The blood donors are in the age group of 18-55 years, they are considered to be the representative of the general population.[7] In India, HIV infected people are divided into high and low risk groups. Former includes sex workers, STD patients and drug users. The low risk group includes pregnant women, the prison population and blood donors.[8] In the similar study by Bhattacharya P *et al*, the prevalence rate for HIV was 0.35%, for HBV-1.66%, for HCV-0.35% and for syphilis was 0.8% [9]. While in Ethiopia, the prevalence rate of TTIs in blood donors were 4.5%, for HIV, 8.2% for HBV and 5.8% for HCV.[10] In Iranian blood donors, these rates were 0.003% for HIV, 0.487% for HBV 0.093% for HCV and 0.0055 for syphilis.[2] In the study by Gupta PK *et al*, the seropositivity of HIV had decreased both in voluntary and replacement donors from 0.53% to 0.51% and 2.22% to 1.535 respectively from the year 2000 to 2004.[4] Similar findings were observed in our study. In the study by Chattoraj A *et al*, seropositivity for HIV was 0.13%, for HBV-0.99% and for HCV- 0.19%.[11] In the study by Iram Manzoor *et al*, the prevalence rate for HIV was 0.05%.[12]

2) Hepatitis B Virus:

In our study, the prevalence rate for HBV infection was from 2.09% to 3.56% with mean of 2.90%. The highest prevalence rate was seen in the year 2002 (3.56%) and lowest in 2010 (2.09%).

Table No 3: Prevalence rate of HBV infection among blood donors in various studies.

AUTHOR	YEAR	PLACE	PREVALENCE RATE
Singhvi A et al [15]	1990	Tamilnadu	Voluntary-1.37%, Replacement-2.96%
Srikrishna A et al [16]	1999	Banglore	1.86%
Mathai J et al [17]	2002	Kerla	3.1%
Sonwane BR et al [18]	2003	Ambajogai	Voluntary-2.78%, Replacement-4.84%
Singh B et al [19]	2004	Delhi	2.76%
Bhattacharya P et al [9]	2007	Kolkata	1.66%
Pahuja S et al [20]	2007	Delhi	2.23%
Chattoraj A et al [11]	2008	Dehradun	0.99%
Behal R et al [21]	2008	Kanpur	2.25%
Diro E et al [10]	2008	Ethiopia	8.2%
Khedmat H et al [2]	2009	Iran	0.487%
Iram Manzoor et al [12]	2009	Lahore	1.70%
Present study	2014	Nanded	2.90%

Transfusion associated hepatitis B continues to be a significant problem in our country. Its prevalence is estimated at approximately 1.5% in postsurgical blood transfusion recipients in India.[13] Hepatitis B is a major public health problem worldwide. Countries are classified on the basis of endemicity of hepatitis B virus infection into high (8% or more), intermediate (2-7%) and low (less than 2%) incidence countries. Prevalence rates of chronic HBV infection in India ranges from 2% to 10% as shown by different studies.[14] (Table No 3)

The prevalence rate in our study was similar to that of Singh B *et al* [19] (2.76%), Sonwane BR *et al* [18] (Voluntary- 2.78%) and Singhvi A *et al* [15] (Replacement- 2.96%). In the study by Khedmat H *et al* [2] in Iran, a decreasing trend in the seroprevalence rate of HBV infection was seen as like in our study. Similarly, Gupta PK *et al* [4] found the declining trend in seroprevalence of HBV infection among blood donors.

3) Hepatitis C Virus:

In our study, the prevalence rate for HCV infection among blood donors range from 0.10% to 0.53%. The mean prevalence rate over 10 years was 0.33%. The highest prevalence rate was seen in year 2004 (0.53%) and lowest in 2010 (0.10%). Declining trend was observed in the prevalence rate of HCV from January 2001 to December 2010**.** (Table No 4)

Table No 4: Prevalence rate of HCV infection among blood donors in various studies.

AUTHOR	YEAR	PLACE	PREVALENCE RATE
Nandi J et al [22]	1994	Gujrat	Voluntary-4.3%
Arankalle VA et al [23]	1995	Maharashtra	0.7%
Jain AKP et al [24]	1999	Delhi	1.57%
Chandrasekaran S et al [25]	2000	Tamilnadu	1.4%
Garg S et al [26]	2001	Rajasthan	0.29%
Das BR et al [27]	2002	Tamilnadu	1.4%
Gupta N et al [28]	2004	Punjab	1.09%
Bhattacharya P et al [9]	2007	Kolkata	0.35%
Chattoraj A et al [11]	2008	Dehradun	0.19%
Diro E et al [10]	2008	Ethiopia	5.8%
Khedmat H et al [2]	2009	Iran	2.1%
Iram Manzoor et al [12]	2009	Lahore	7.69%
Present study	2014	Nanded	0.34%

The mean prevalence rate in our study was similar with the study by Bhattacharya P *et al* [9] (0.35%) and Garg S *et al* [26](0.29%). In the study by Khedmat H *et al* [2] declining trend was found in seroprevalence of HCV as like in our study.

4) Syphilis:

In our study, the mean prevalence rate for syphilis infection was 0.018%. The highest prevalence rate was seen in year 2001 (0.064%), while lowest was in 2006 to 2010 (0%). (Table No 5)

Table No 5: Prevalence rate of syphilis infection among blood donors in various studies.

AUTHOR	YEAR	PLACE	PREVALENCE RATE
Mathai J et al [17]	2002	Kerla	0.2%
Singh B et al [19]	2004	Delhi	0.5%
Gupta PK et al [4]	2004	Pune	Voluntary- 0.27%
			Replacement-0.85%
Bhattacharya P et al [9]	2007	Kolkata	0.68%
Chattoraj A et al [11]	2008	Dehradun	0.62%
Iram Manzoor et al [12]	2009	Lahore	0.5%
Khedmat H et al [2]	2009	Iran	0.04%
Present study	2014	Nanded	0.018%

The mean prevalence rate for syphilis in our study is near to that of Khedmat *et al*. [2] In the study by Gupta PK *et al* [4], the trend in prevalence rate for syphilis infection was declining in both voluntary and replacement donors. The mean prevalence rate in voluntary donors was 0.27% and in replacement donors 0.85%. Khedmat H *et al* [2] found 0.04% of prevalence rate or syphilis with increasing trend in the infection from the year 2003 to 2005. In the study by Iram Manzoor *et al* [12], the prevalence rate for syphilis was 0.5%.

CONCLUSIONS:

In our study of trends in sero-prevalence of HIV, hepatitis B,hepatitis C and syphilis infections among blood donors from January 2001 to December 2010, the mean prevalence rate of hepatitis B (2.90%) was highest and that of syphilis (0.018%) was lowest. Declining trends were observed in the seroprevalence of all the four infections- HIV, HBV, HCV and syphilis, which might be the result of more scrutiny in donor selection and improved sensitivity of serological tests. So, formulation of safe blood transfusion policy and implementation of standard screening protocol should be practiced.

REFERENCES:

1) Kaur P, Basu S. Transfusion-transmitted infections: Existing and emerging pathogens. J Postgrad Med 2005;51:146-151

2) Khedmat H, Fallhian F, Abolghasemei H, Alavian SM, Hajibeigi B, Miri SM, Jafari AM. Seroepidemiological study of hepatitis B virus, hepatitis C virus, human immunodeficiency virus and syphilis infections in Iranian blood donors. Hep Mon, 2009;9(1):24-28.

3) Fiebg EW, Busch MP. Emerging infections in transfusion medicine. Clin Lab Med, 2004; 24:797-823.

4) Gupta PK, Kumar H, Basannar DR, Jaiprakash M. Transfusion Transmitted Infections in Armed Forces; prevalence and trends. Medical Journal Armed Forces India Medical Journal Armed Forces India, 2006; 62(4):348-350.

5) Choudhury, Avagiri and Ray. True HIV prevalence in Indian blood donors. Transfusion medicine, 2000; 10:1-4.

6) Government of India, Ministry of Health and family Welfare, national AIDS Control Organization. 2009. NACO guidelines on HIV surveillance. (accessed 2009 Feb9) Full text.

7) Deshpande M, Bamne A, Gogate A, Samani P. Trends in prevalence of HIV infection in general population in Mumbai. Inf Conf AIDS, 2002 Jul (14):7-12.

8) Jayati Ghosh et al 2002. A geographical prespective on HIV/AIDS in India. The Geographical Review; vol 92.

9) Bhattacharya P, Chandra PK, Datta S, Banerjee A, Chakravarty R. Significant increase in HBV, HCV, HIV and syphilis infections among blood donors in west Bengol, Eastern India. 2004-2005: Exploratory screening reveals high frequency of HBV infection. World J Gastroenterol, 2007; 13(27):3730-3733.

10) Diro E, Alemu S, Yohanner A. Blood safety and prevalence of transfusion transmissible viral infections among blood donors at Red Cross Blood bank in Gondar University hospital, Ethiop. Med J, 2008; Jan; 46(1):7-13.

11) Chattoraj A, Behl R,Kataria VK. Infectious Disease markers in Blood Donors. Medical Journal Armed Forces India. 2008; 64:33-35.

12) Iram Manzoor, N Hashmi, S Daud, S Ajmal, H Fatima, Z Rasheed and S Syed. Seroprevalence of transfusion transmissible infections (TTIs) in blood donors. Biomedia, 2009; 25:154-158.

13) Choudhury V, Nanu A, Panda SK, Chand P. Evaluation of serologic screening of blood donors in India reveals a lack of correlation between anti-HBc titer and PCR- amplified HBV DNA. Transfusion. 2003; 43:1142-1148.

14) Prevention of hepatitis B in India, An overview, World Health Organization, 2002. New Delhi,

15) Singhvi A, Pulimod RB, John TJ, Babu PG, Samuel BU, Padankatti T, Carman RH. The prevalence of markers for hepatitis B and human immunodeficiency viruses, malarial parasites and microfilaria in blood donors in a large hospital in south India. J Trop Med Hyg. 1990; 93;178-182.

16) Srikrishna A, Sitalakshmi S, Damodar P. How safe are our safe donors? Indian J Pathol Microbiol. 1999; 42:411-416

17) Mathai J, Sulochana PV, Satyabhama S, Nair PK, Sivakumar S. Profile of transfusion transmissible infections and associated risk factors among blood donors of Kerla. Indian J Pathol Microbiol. 2002; 45; 319-22.

18) Sonwane BR, Birare SD, Kulkarni PV. Prevalence of serpreactivity among blood donors in rural population. Indian J Pathol Microbial. 2003; 57:405-407.

19) Singh B, Kataria SP, Gupta R. Infectious markers in blood donors of East delhi: Prevalence and trends. Indian J Pathol Microbiol. 2004; 47:477-479.

20) Pahuja S, Sharma M, Baitha B, Jain M. Prevalence and trends of markers of Hepatitis C virus, Hepatitis b virus and Human immunodeficiency virus in Delhi blood donors: A hospital based study. Jpn J Infect Dis. 2007; 60:381-391.

21) Behel R, Jain R, Behel KK, Bhagoliwal A, Aggarwal N, Dhole TN. Seroprevalence and risk factors for hepatitis B virus infection among general population in northern India. Arg Gastroenterol. 2008; 45:137-140.

22) Nandi J, Bhawalkar V, Mody H, Elavia A, Desai PK, Banerjee K. Detection of HIV-I, HBV and HCV antibodies in blood donors from Surat, western India. Vox Sang, 1994; 67:406-407.

23) Arankalle VA, Chadha MS, Jha J, Amarapurkar DN & Banerjee K. Prevalence of anti-HCV antibodies in western India; Indian J Med Res 1995; 101:91-93.

24) Jain AKP, Madan K, Das UP, Budhiraja S, Gopalkrishna V, Sharma JK. Das BC. Hepatitis C virus infection in sporadic fulminant viral hepatitis in north India: Cause or co-factor? Eur J Gastroenterol Hepatol. 1999; 11:1231-1237.

25) Chandrasekaran S, Palaniappan N, Krishnan V, Mohan G, Chandrasekaran N. Relative prevalence of hepatitis B markers and hepatitis c virus antibodies (anti-HCV) in Madurai, south India; Indian J Med Sci 2000;54:270-273.

26) Garg S, Mathur DR, Garg DK. Comparison of seropositivity of HIV, HBV, HCV & syphilis in replacement & voluntary blood donors in western India; Indian J Pathol Microbiol. 2001; 44:409-412.

27) Das BR, Khandapkar R, Sahni S. Geographical distribution of hepatitis C virus genotype in India; Indian j Pathol Microbiol, 2002;45:323-28.

28) Gupta N, Kumar V, Kaur A. Seroprevalence of HIV, HBV, HCV & syphilis in voluntary blood donors. Indian j Med Sci. 2004; 58:255-257.