



Prevalence of Hepatitis B Antigen amongst the voluntary blood donors in a tertiary care institution

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Abstract

The study was undertaken to find out the prevalence of Australia antigen (HBs Ag) positivity in 180 cases of blood donors and to compare the prevalence of hepatitis B virus in blood donors in relation to the profession and other factors. Out of 180 blood donors, 113 (62.77%) were replacement (Needy) blood donors and 67 (37.22%) were voluntary blood donors. Among the 113 (62.77%) replacement donors, 97 (53.88%) were males and 16 (8.88%) were females and in 67 (37.22%) voluntary blood donors all (37.22%) were males. 3 (1.66%) cases were positive for hepatitis B surface antigen (HBs Ag) out of 180 blood donors and 177 donors were negative for any of hepatitis B disease. In the Australia antigen positive group all the 3 (1.66%) positive donors were males. The age of these positive donors varies from 30 - 50 years. Prevalence of seropositivity was higher (1.77%) in the replacement (Needy) donors as compared to (1.49%) in the voluntary blood donors. 1 (33.33%) positive case had a history of sexual contact with extramarital relations. 1 (33.33%) case had a positive history of contact with a jaundice patient in the family. 1 (33.33%) positive case had history of repeated needle injections.

Keywords: Blood, donor, hepatitis, HBSAg, virus, jaundice

Introduction

Hepatitis implies acute inflammation of liver. It is one of highly infectious diseases affecting the human population and is a matter of great concern in public health agencies, teaching institutions, clinics and research laboratories throughout the world. The magnitude of the disease is too serious to be neglected and has been aggravated by the

extensive use of blood transfusion and its products. Hepatitis is caused by various hepatotropic viruses more often than other causes like pyogenic organisms, tuberculosis, drugs, toxins and alcohol etc. Viral hepatitis is specifically caused by a group of hepatotropic viruses that is, the viruses which have

a predilection for the liver. These viruses are designed as hepatitis A, B, C, D, E and more recently Hepatitis G virus. All these viruses have different morphological features and mode of transmission.

Both hepatitis-B and hepatitis-C viruses are parenterally transmitted and cause acute and chronic hepatitis, cirrhosis and even malignancy. Liver disease from hepatitis-B virus is an enormous problem globally with an estimated worldwide carrier rate of 300 million. In the United States there are 300,000 new infections per year.¹ About 21-35 million persons are suffering from hepatitis-B in India.^{2,3} It is endemic in Sub-Saharan Africa and South East Asia where 20% of population acquire infection early in the life. Prevalence of carrier rate varies from 0.1% to 0.2% in Britain, USA and Scandinavia to more than 3% in Greece and Southern Italy, 10-15% in Africa and Far East⁴ even higher in Eskimos.⁵

Spread occurs through parenteral route by blood and body fluids as primary vehicle of transmission. Virus may also spread by contact with body secretions like semen, saliva and various pathologic effusions. It is also transmitted by many natural mechanisms that transfer minute quantities of blood or tissue fluids between the persons.³ Even from the pregnant mother, vertical transmission can occur. Horizontal transmission by sharing items like tooth brushes and razors with an infected person has also occurred. There are studies which show that even blood sucking arthropods such as mosquitoes and bed bugs can be important vectors.⁴ Tattooing, ear piercing, acupuncture without rigorous sterilization causes its spread. It can also spread by use of unsterilized instruments for dental procedures, neurological examination, prophylactic inoculations, and subcutaneous injections. In one third to 46% of patients source of infection is unknown.^{1,6} But infected blood transfusion continues to be an important source of hepatitis B in countries where donor blood is not screened.

High risk groups which are more prone to get infection include recipients of infected blood transfusion and its products, parenteral drug

abusers^{7,8}, Homosexuals⁹, heterosexuals with multiple partners¹⁰, immunodeficient persons¹¹, household contacts⁶, low socio-economic status², patients of leukemia¹² and patients on dialysis, organ transplants, renal failure.¹³ Hospital staff is particularly prone to hepatitis B infection.¹⁴

Government of India in 1989 recommended the mandatory screening of all blood donors for HBsAg and for HCV it was implemented from June 2001.¹⁵ Post transfusion hepatitis was reduced by 25% when HBsAg screening was implemented¹⁶ and further reduced to 70% when the blood collection switched from professional blood donors to voluntary blood donors.

Materials and Methods

The present study was conducted on 180 cases of blood donors of all ages and both sexes coming at Govt. Medical College, Amritsar to know the Hepatitis B virus positivity and compared the prevalence of Hepatitis B in relation to profession and other factors.

Sample Collection: Taking all aseptic precautions 4 cc of blood from each donor was collected. It was centrifuged and clear serum was separated without haemolysis and stored in different vials in the freezer compartment of the refrigerator as specified. These samples were duly coded and divided into two batches, each batch containing 90 serum samples.

Methods of testing: Each serum sample was tested for Australia antigen (HBsAg) by ELISA method. This test was done to detect Australia Antigen or Hepatitis B surface antigen (HBsAg) using specific monoclonal anti HBs antibodies by Genedia HBsAg ELISA 3. (Enzyme Linked immunosorbent Assay) Test system kit supplied by the Korea Green Cross Corporation. Results were interpreted as per the cut off value. Those serum samples found positive for HBs Ag were subjected to repeat Elisa test to reconfirm positivity.

Observations

The present study comprises 180 cases of blood donors of all the ages and both sexes, coming to the Govt. Medical College and Hospital, Amritsar from the different places. The study was undertaken to find out the prevalence of Australia antigen (HBs Ag) in the blood donors and to compare the prevalence of hepatitis B virus in the blood donors in relation to the profession and other factors. The history of each donor was recorded as per the proforma attached.

Age and Sex: Out of the 180 blood donors 164 (91.11%) donors were males and 16 (8.88%) donors were females. The age of donors ranged from 18-50 years with the highest number of donors in the age group of 21- 30 years. The age of male donors ranged from 18-50 years and was Maximum in the age group of 21-30 years and the age of female donors varied between 18-40 years

and was maximum in the age group of 21-30 years. Most of the blood donors were between 20-40 years of age (Table 1).

Replacement (Needy) versus Voluntary Blood Donors: In the present study, no commercial blood donor was included. Out of 180 blood donors 113 (62.77%) were replacement (needy) donors and 67 (37.22%) were voluntary donors. Among the 113 replacement donors 97 (53.88%) were male donors and 16 (8.88%) were female donors and all 67(37.22%) voluntary donors were males. In replacement donors age of male donors varies from 18-50 years, maximum number of donors was in the age group 21-30 years and age of female donors varied from 18-40 years, maximum being in the age group of 21-30 years. Among voluntary blood donors age of male donors varied from 18-50 years, maximum donors in the age group of 21-30 years and there was no female voluntary donor (Table 1).

Table 1. Age and Sex Wise Distribution of Replacement and Voluntary Blood Donors

Age (years)	Replacement donors						Voluntary blood donors						Total					
	Male		Female		Total		Male		Female		Total		Male		Female		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
18-20	13	7.22	2	1.11	15	8.33	20	11.11	0	0	20	11.11	33	18.33	2	1.11	35	19.44
21-30	39	21.66	11	6.11	50	27.77	35	19.44	0	0	35	19.44	74	41.11	11	6.11	85	47.22
31-40	33	18.33	3	1.66	36	19.99	9	5.0	0	0	9	5.0	43	23.88	3	1.66	46	25.54
41-50	12	6.66	0	0	12	6.66	3	1.66	0	0	3	1.66	14	7.77	0	0	14	7.77
Total	97	53.88	16	8.88	113	62.76	67	37.22	0	0	67	37.22	164	91.09	16	8.88	180	100

Past history: History of blood transfusion was positive in one case 2 cases had positive history of sexual contact, one case had history of contact with a jaundice patient in the family, 2 cases had history of repeated injections, and one case had no obvious clinical history to suggest possible source of infection and was of very low socio economic status. One (33.33%) case had a positive history of extramarital sex relations. One (33.33%) case showed positive history of contact with a Jaundice patient in the family. One (33.33%) case showed history of repeated injections.

HBsAg positive cases: All the 3 (1.66%) cases out of 180 donors were positive in the males and no case was positive in females. In individual subgroups Australia antigen was positive in 3

(1.82%) out of 164 male donors and out of 16 female donors no case was positive (0%) showing the male preponderance. The 3 (1.66%) positive cases in this study which were males varied from 31-50 years with 2(1.11%) positive cases in the age Group of 31-40 years and 1 (0.55%) positive case in the age group of 41-50 years. Out of 180 blood donors, 113 (62.77%) were replacement (Needy) donors and 67 (37.22%) were voluntary donors. 2 (1.77%) cases were positive for HBs Ag out of 113 replacement donors which were males and 1 (1.49%) case was positive in 67 voluntary donors which was also male. This shows the higher prevalence of seropositivity (1.77%) among replacement (Needy) donors than (1.49%) in voluntary donors (Table 2).

Table 2. Distribution of HbSAg Positive Donors (Out of 180 Blood Donors)

Distribution		No. tested	Male		Female		Total	
			N	%	N	%	N	%
Age (years)	18-20	35	-	-	-	-	-	-
	21-30	85	-	-	-	-	-	-
	31-40	46	2	1.11	-	-	2	1.11
	41-50	14	1	0.55	-	-	1	0.55
	Total	180	3	1.66	-	-	3	1.66
Type of donor	Replacement	113	2	1.77	-	-	2	1.77
	Voluntary	67	1	1.49	-	-	1	1.49

Discussion

The present study was conducted to know the prevalence of hepatitis B surface antigen (HBs Ag) positivity in 180 cases of blood donors and to compare the prevalence of hepatitis B virus in blood donors in relation to the profession and other factors as per the proforma attached. Study was conducted in the blood donors of all the ages and both sexes coming to the Govt. Medical

College and Hospital, Amritsar from the different places. The methods used to detect hepatitis B surface antigen i.e. Australia antigen (HBs Ag) by ELISA (Enzyme Linked Immunosorbent Assay) method using specific monoclonal anti hepatitis B surface antibodies. In this study group, 3 cases out of 180 blood donors were positive for Australia antigen.

Table 3. Comparison of prevalence in the study group with other studies

Author	Year	Prevalence of HBsAg	Population
Blumberg et al ¹⁷	1965	2.23%	Normal healthy
Cossart ¹⁸	1972	1 - 5%	Blood donors in India
Sama et al ¹⁹	1973	1.6%	Normal healthy
Joshi & Dharmadhikari ²⁰	1974	1.9%	Normal healthy
Thyagarajan et al ²¹	1981	0 - 4%	
Sherlock ⁴	1983	0.1 - 0.2 %	Britain
		10-15%	Africa
McMahon et al ⁵	1987	Up to 40%	Alaskan Eskimos
Park ²²	1991	0.6% - 5.8%	National Institute of Virology, Pune
Mutimer et al ²³	1994	14%	Sub-Saharan Africa
Gupta et al ²	1996	2.3%	Blood donors
Sikka et al ²⁴	1996	1.4%	Blood donors
Patil et al ¹⁵	1996	1.53 - 4.2%	Blood donors
Nanu et al ²⁵	1997	1.60 - 2.45%	Blood donors
Lo et al ²⁶	1999	20.3%	Blood donors
Mendez et al ²⁷	1999	0.11%	Blood donors
Pahuja et al ²⁸	2002	2.42%	Blood donors
Jaiswal et al ²⁹	2005	1.72%	Blood donors
Ali et al ³⁰	2007	2.4%	Blood donors
Dayan et al ³¹	2010	3.17%	Blood donors
Souan et al ³²	2013	0.52%	Blood donors
Osei et al ³³	2014	7.5%	Blood donors
Farooq et al ³⁴	2017	2.64%	Blood donors
Present study	2001	1.66%	Blood donors

Differences in the figures with the present study may be due to regional variations and study on small group of population. One case out of 3 Australia antigen positive blood donors had a positive history of extra marital sex relations. Various studies showed that the sexual contact also helps in the spread of hepatitis B virus and found in 14% cases³⁵, 3.6% in commercial sex

workers³⁶ and 20%²⁷. The figure in the present study is near to 20% given by Mendez et al (1999)²⁷. Though the present study is at the variance with the low figures of 14% by Alter et al (1989)³⁵ and 3.6% by Irshad et al (1994)³⁶, yet it shows an important mode of transmission by this route. (Table 3, 4)

Table 4. Prevalence of HBSAg positivity with history of sexual contact

Author	Year	Percentage
Alter et al ³⁵	1989	14.0
Irshad et al ³⁶	1994	3.6
Mendez et al ²⁷	1999	20.0
Present study	2001	33.33

One case showed positive history of contact with a jaundice patient in the family, suggesting that other modes of transmission also operate. Various studies showed that risks with this route is found in 28%³⁷, in 40% of spouses and household members of HBs Ag carriers⁹, 22%³⁸ and 29%⁶.

One case showed positive history of exposure to repeated injections from the private practitioner for some illness. This could be due to the fact that the syringes could not be rigorously sterilized and so can transmit infection from one person to another person. Hepatitis B virus can spread by Use of unsterilized instruments for dental procedure, prophylactic inoculation, subcutaneous injections, ear piercing, acupuncture etc. especially where strict sterilization measures are not taken.⁴ Other studies showed that risks by this route can occur as found in 4%³⁷, 20%⁶.

In present study, regarding the age distribution, the age of the Australia antigen positive cases varied from 31-40 years in 2 (66.66%) cases and in 1 (33.33%) case, age varied from 41-50 years.

It was quite in accordance with the various studies which showed that the highest number of HBs Ag positive cases occur in this age group as found in the age group of 20-40 years¹¹, 20-29 years³⁷, 18-39 years² and 40-49³⁹.

Regarding the sex distribution, all Australia antigen positive cases are males. This is in accordance with the studies which showed that

HBs Ag positive cases occur predominantly in the males.^{2,18,39,40}

In the present study, seropositivity was higher (1.77%) in replacement (Needy) blood donors than (1.49%) in voluntary blood donors. It is quite in accordance with the previous studies.^{15,25}

A study showed that the seropositivity was even higher in the commercial blood donors.⁴¹ They observed that there exists an undocumented socioeconomic difference in the distribution of viral agent in the community as such that the poor, adult man by selling their blood to support themselves, are more frequent carriers. In the present study these commercial blood donors were not entertained and discouraged.

Higher positivity in the replacement (Needy) blood donors could be due to the fact that as commercial blood donors are not entertained and discouraged. However, some commercial blood donors may manage to donate their blood as replacement donors posing as a close relative of the recipient.¹⁵ Replacement donors on the other hand are also compelled to donate blood and so in a given time frame which renders questioning pertaining to the donor's health and sexual habits ineffective. While voluntary blood donors invariably belong to higher social class, have more education and can Understand better the implications of donor questioning, so have lower positivity rate.²⁵

Table 5. Prevalence of HBsAg positively

Author	Year	Prevalence of HBs Ag positively
Kuhnl et al ⁴²	1989	0.42%
Choo et al ⁴³	1990	0.4 - 1.4%
Tao et al ⁴⁴	1991	2.1%
Weiland et al ⁴⁵	1992	0.9 – 2.0%
Williams et al ⁴⁶	1992	2.2%
Darwish et al ⁴⁷	1992	14.4%
Leite et al ⁴⁸	1992	3.1%
Sherlock et al ⁴	1993	0.1% - 2% (Worldwide)
Timan et al ⁴⁹	1993	1.6%
Jaiswal et al ⁵⁰	1996	North India 0.3 – 4% South India 11.3% East India 0.12% Central India 1.78%
Murphy et al ⁵¹	1996	0.36%
Cantilena et al ⁵²	1996	0.5%
WHO ⁵³	1997	Up to 3%
Ariamkina et al ⁵⁴	1998	1.4 - 1.98%
Deshpande et al	1998	0.34%
Machave et al ⁵⁵	1999	0.44% 0.2 - 4% (on small group of population)
Ashraf et al ⁵⁶	2006	0.7%
Ofori-Asenso et al ⁵⁷	2015	12.3%
Present study	2001	2.22%

The figure in the present study is in accordance with the figures in various studies as 10-50%⁵⁸, 14.3-25%⁵⁹, 27%⁵². Though the present study differs from the reports given by the various other studies, yet it shows that the epidemiological correlation exists between the transfusion and development of post transfusion hepatitis. (Table 5)

Differences in the figures may be due to regional variation, study on Small group of population and fall in rate of positivity could be due to the Pre transfusion screening of the blood donors and taking better precautionary measures.

Conclusion

Hepatitis B is an important cause of viral hepatitis. Australia antigen (HBs Ag) is an important marker in the diagnosis of hepatitis B. The prevalence of Australia antigen positivity (HBs Ag) is (1.66%) among the 180 blood donors in the present study. Sexual contact and parenteral drug abuse seem to be more important as a route of transmission in hepatitis B than in hepatitis C. Hepatitis C is the more common cause of transfusion related hepatitis as compared to hepatitis B.

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