

Original Research Article

PREVALENCE OF HEPATITIS B AMONG VOLUNTARY BLOOD DONORS IN THE INDUSTRIAL ZONE OF WESTERN MAHARASHTRA.

ABSTRACT

Around a million deaths are caused by Hepatitis B virus (HBV) infection worldwide. Almost more than 257 million people live with chronic Hepatitis B infection all around the world ending up with hepatocellular carcinoma. This has become a major concern of public health nowadays. The present study was aimed to assess the prevalence of Hepatitis B infection among voluntary healthy blood donors in the industrial zone of Western Maharashtra. A total of 5000 donors fulfilled the inclusion criteria of the study and was accepted for blood donation during the study period of May 2019 to October 2020. The blood samples were tested for Hepatitis B surface Antigen as well as other Transfusion Transmitted Infections. Out of 5000 donors, the prevalence of HBsAg positive donors in our study was 0.62%. The HBsAg positivity rate was higher among the males (0.7 %) as well as among the age group of 56 to 60 yrs (1.5 %). It was concluded from the present study that the prevalence of Hepatitis B is showing a decreasing trend among voluntary blood donors when compared to similar studies. Education and awareness about blood borne infections, mass immunizations, encouragement of voluntary blood donations and vigorous screening of donors help to achieve reduction in the load of Hepatitis B.

Keywords : Hepatitis B, Prevalence, Voluntary blood donor

INTRODUCTION

Around a million deaths are caused by Hepatitis B virus (HBV) infection worldwide [1] Almost more than 257 million people live with chronic Hepatitis B infection all around the world. [2] Hepatitis B virus was discovered in 1967, a DNA virus which belongs to the Hepadna viridae family and is a hepatotropic virus. [3] The diseases caused by Hepatitis B infection comprise of acute and chronic hepatitis, cirrhosis and hepatocellular carcinoma. This has become a major concern of public health nowadays. [4] It is a bloodborne infection and is also present in low concentrations in saliva as well as other body fluids of carriers. [5] The virus has an incubation period of 90 days but can fluctuate from six weeks to six months. [6] As the virus is transmitted through blood and blood products, unsafe blood is still a key health apprehension and public health issue in many developing countries. [7]

Various studies have shown that there is a lot of variation in the prevalence rate of HBsAg in India ranging from 2 to 8 %. Also, India has more than 37 million HBV carriers out of a population of more than 1.25 billion which add a huge portion to the global pool of carriers of HBV. So it is very vital to conduct bigger researches to superiorly assess the HBV epidemiology and recognize areas with high prevalence and eventually emphasize on improving the public health strategies to prevent transmission of the disease, thereby reducing the disease load. [8,9]

The initial move in confronting the disease load of HBV in India is to have a better and extra precise evaluation of the disease load. As the blood donors symbolizes the healthy population, study in blood donors will directly reflect the prevalence of the infection in healthy population. [9] With this background, the present study was aimed to assess the prevalence of Hepatitis B infection among voluntary healthy donors in the industrial zone of Western Maharashtra.

MATERIALS AND METHODS

This was a cross-sectional study conducted at the blood bank of a tertiary care hospital in Pimpri Chinchwad, Pune. The period of study was spread from May 2019 to October 2020. The study included 5000 voluntary blood donors coming to the blood bank as well as to the blood donation camps held by the hospital.

The study protocol was approved by the Scientific and Ethics Committee of the Institution (Research Protocol No.IESC/PGS/2019/186 dated 11/09/2019). Donors were interviewed and explained about Transfusion Transmitted Infections and the tests are carried out for the same. Thereafter, written consent was obtained from all the donors after counselling. Donors were screened for HBsAg using ELISA test (Monolisa™ HBsAg ULTRA). A stringent privacy was preserved about the individual particulars of the participants and data linked to the study. All healthy voluntary blood donors of age group 18 to 60 years were included in the study. Prior to screening, each blood donor was assessed by routine physical examinations for rejection criteria. Replacement donors, paid and professional donors and those with previous history of HBV, HCV and HIV infections were excluded.

RESULTS

The study included a total of 5000 healthy voluntary blood donors over a period of one and half years from May 2019 to October 2020. Amongst the 5000 total donors, 88 % of the donors were males and 12 % were females. The prevalence of Hepatitis B in our study is 0.62%, i.e., 31 HBsAg positive donors out of 5000 donors. Out of 31 HBsAg positive donors, 96.7% were males and 3.22% were females And out of 4404 male donors, 0.7 % of males were positive for HBsAg while out of 596 female donors, 0.2 % females were positive for HBsAg. The distribution of donors according to gender is shown in Table 1.

Donors	Within HBsAg positive donors	HBsAg Negative Donors	Total	HBsAg positivity within the gender group
Males	30 (0.599%)	4374 (87.40%)	4404 (88 %)	0.7 %
Females	1 (0.199%)	595 (11.80%)	596 (12%)	0.2 %

Total	31 (0.62%)	4969 (99.38%)	5000	0.9
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Table 1: Distribution of positive and negative donors according to gender

Majority of the donors 51.7% belonged to the age group of 18 to 25 years while the least were between the age group of 56 to 60 years. Amongst the HBsAg positive donors, 32.3 % were between the age group 18 to 25 yrs, and another 32.3% were in the group 26 to 35 yrs, 22.6 % were between 36 to 45 yrs, 9.7 % were between 46 to 55 yrs and 3% belonged to the group 56 to 60 years. The mean age of HBsAg positive donors is 32 years. When we compared individual age groups, the lowest HBsAg positivity rate was among the age group of 18 to 25 years of 0.4 %, and the highest was between the age group of 56 to 60 years of 1.5 %. The distribution of donors according to age group is shown in Table 2.

Donors	Within HBsAg positive donors (n)	HBsAg negative (n)	Total	HBsAg positivity within the age group
18 to 25 yrs	10 (0.2%)	2576 (51.5%)	2586 (51.7%)	0.4 %
26 to 35 yrs	10 (0.2%)	1406 (28.1%)	1416 (28.3%)	0.71%
36 to 45 yrs	7 (0.14%)	691 (13.76%)	698 (13.9%)	1.0 %
46 to 55 yrs	3 (0.06%)	228 (4.54%)	231 (4.6%)	1.3 %
56 to 60 yrs	1 (0.02%)	68 (1.38%)	69 (1.4%)	1.5 %
Grand Total	31 (0.62%)	4969 (99.38%)	5000	4.91

Table 2 : Distribution of positive and negative donors according to age

The overall blood group status of donors were as follows : O positive 31.1%, O negative 1.7 % , A positive 25.5%, A negative 1.1%, B positive 29.7% , B negative 1.7%, AB positive 8.8 % and AB negative donors were 0.3 % . Amid the HBsAg positive donors, 97 % were Rh positive and 3 % were Rh negative. The overall blood group status of HBsAg positive donors were as follows : 32.3% donors had O positive, 3% had O negative, 32.3 % had A positive, 25.8% had B positive and 6.45% donors had AB positive blood group. The distribution of HBsAg positive donors according to blood group is shown in Figure 1.

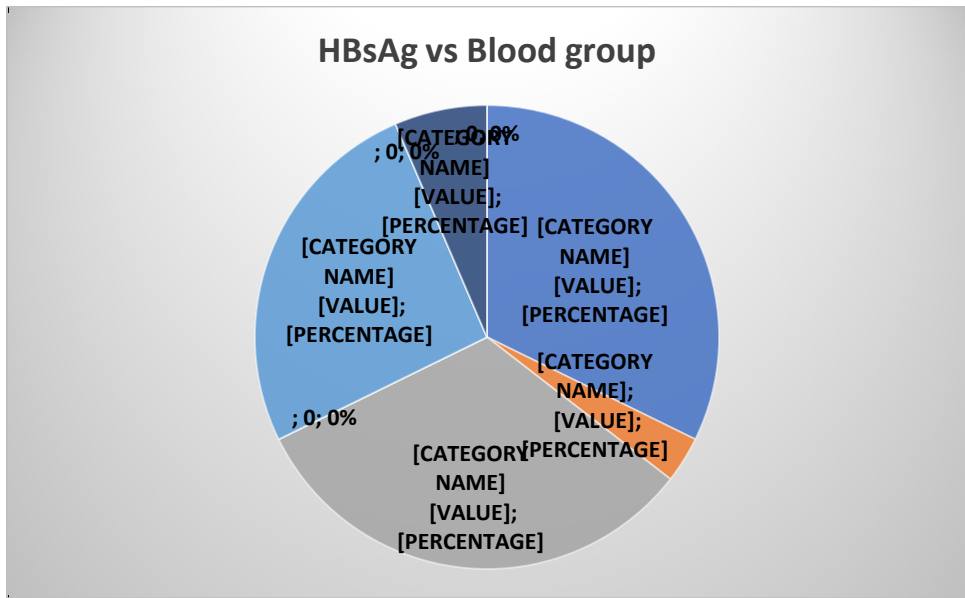


Figure 1: Distribution of HBsAg positive donors according to blood group

DISCUSSION

Blood transfusion and transfusion of blood products has become an inevitable part of patient management these days. But the complications due to transfusion are also at the same pace. Although many complications are minor and manageable immediately, there are few life-threatening complications under which Transfusion Transmitted Infections fall. [10] For every blood transfusion there is always a risk of 1% of getting Transfusion Transmitted Infections. [11] So this demand a scrupulous testing and screening prior to transfusion. [10]

Out of these Transfusion Transmitted Infections, Hepatitis B has become a major issue because of its specific characteristics like the incubation period is very long, the carrier or latent state of the virus, the property of the virus to cause infection as asymptomatic or subclinical, and the virus is stable and viable inside the blood and blood products for a long time period. [10] Last but not the least, it is an important risk factor for the development of chronic hepatitis and hepatocellular carcinoma.

Evaluating the data of prevalence of Transfusion Transmitted Infections helps to assess the status of infections among blood donors which consequently assess the safety of the donated blood. These studies also give an idea about the epidemiology of the particular infection in that area or community as the voluntary blood donors represent the general healthy population always. [12]

In the present study, the overall incidence of HBsAg positivity is 0.62%. Our results are comparable with the results of international studies conducted by Marion Vermulen et al which showed a prevalence rate of HBsAg of 0.66 % [13] as well as the studies done by Song Yan et al which showed a prevalence rate of 0.87 %. [14] These results are also analogous to the study done by V. Bhagyalakshmi et al in India, which showed a prevalence rate of 0.58 %. [10] When we observe the prevalence rates of HBsAg in other countries it ranges from 14.3 % in the study by Uneke C J in Nigeria [15] to 0.87 % in the study by Song, Yan et al in 2010 in Western China [14]. Similar researches done in India shows a variation in the prevalence of HBsAg from 2.6%, study by Yashovardhan A et al [17] to 0.58 %, study by V Bhagiyalakshmi et al [10]. When the prevalence rates of other countries are compared, it shows India is falling in the prevalence rate category of 2 % for Hepatitis B. Also, as we observe the rates of similar research conducted in India we can notice that the endemicity rate of Hepatitis B in India is showing a decreasing trend over the years. This decreasing trend should be credited to effective immunization against Hepatitis B available in India. The comparison of similar national and international studies are shown in Table 3 and Table 4 respectively.

Our study showed a low percentage of female donors as compared to male donors. The HBsAg positivity rate within each gender group also showed a male predominance of 0.7 %. The low number of female donors could be attributed to increased prevalence of anemia among women, especially the menstruating age group. Another cause could be due to the low literacy rate and the trend which doesn't allow females to be involved in such activities by the head of their families. Fear of blood donation, lack of awareness as well as lack of privacy for female donors during blood donation camps could be other reasons. These trends in gender are also observed in studies conducted by Arora D et al. in 2010 in Southern Haryana where the percentage of males was 96 as compared to 4 % of females [11] as well as the research done by Yashovardhan A et al [17] which showed 99.08 %. While the study by V Bhagiyalakshmi et al in Tamil Nadu showed 39 % female donors. [10] Our observations are also comparable with international studies done by Uneke CJ et al [15], Fouelifack Ymele F in Cameroon in 2008 [18], Julius Tieroyaare Dongdem et al in Africa [19], Al-Rubaye A et al in Iraq [20], and Eric Osei et al in Ghana, Africa where it showed a male predominance. [21]

The maximum number of HBsAg positive donors in our study were in the age group of 18 to 35 years. These results are comparable with the studies by Arora D et al. which showed the maximum number of positive cases of hepatitis B in the age group of 18 to 31 years, [11] as well as the study done by Yashovardhan A et al which showed the maximum cases in the age group of 21 to 30 years [17] and the study done by V Bhagiyalakshmi et al which showed 18 to 30 yrs age group with maximum cases [10]. Similar results can also be observed in international studies by Uneke CJ et al. [15], Fouelifack Ymele F et al. [18], Julius Tieroyaare Dongdem et al. [19], Song, Yan et al. [14], Zhen Whang et al. [22], and Abdo AE et al.. [23]

When we compared HBsAg positivity rates in individual age groups, the highest positivity rates of HBsAg were for the group of 56 to 60 years and the lowest was for the age group 18 to 25 years. This could be due to the fact that exposure increases with age. Also, the low positivity rate in the younger age group could be credited to the efficient vaccination program against Hepatitis B getting implemented in India with compulsory inclusion of Hepatitis B vaccine in the National

Immunization Schedule starting with first dose of Hepatitis B at birth or as early as 24 hours since birth. [24]

The majority of blood donors were having O positive (31.1%) and B positive (29.7 %) blood group which are the most common blood groups among general population. Also, Rh negative donors comprised the least number which constituted the people with rare blood groups. This result is comparable with the study by Sinha rtk et al. in 2017 which also showed maximum number of donors with O positive blood group. [24] Also, a greater number of HBsAg positive donors were having the blood group O and A positive. Even though the study by Sinha RTK et al. showed maximum number of donors with O positive blood group, the maximum number of positive donors were having B positive blood group and was not statistically significant. [25] Another two studies by Tyagi and Tyagi [26] and by Nigam et al [27] showed increased seroprevalence with negative groups.

Author	Year	Place	Prevalence Hepatitis B
Srikrishna A et al. ^[16]	1999	Bangalore, Karnataka	1.86%
Gupta PK et al. ^[28]	2004	Pune	1.22%
Pahuja S et al. ^[29]	2007	Delhi	2.23%
Bhattacharya P et al. ^[12]	2007	Kolkata	1.46%
Chandra T et al. ^[30]	2009	Lucknow	1.96%
Arora D et al. ^[11]	2010	Southern Haryana	1.70%
Yashovardhan A et al ^[17]	2012	Andhra Pradesh	2.60%
V Bhagiyalakshmi et al ^[10]	2015	Thiruchirappalli, Tamil Nadu	0.58%
Chandekar SA et al. ^[31]	2017	Mumbai	1.30%
Present Study	2020	Pune	0.62%

Table 3 : Comparison of similar studies conducted in India

Author	Year	Place	Prevalence Hepatitis B
Uneke CJ et al ^[15]	2002	Nigeria	14.30%
Al Waleedi et al ^[32]	2007	Aden city, Yemen	5.10%
Fouelifack Ymele F ^[18]	2008	Yaoundé (Cameroon)	12.14%
Julius Tieroyaare Dongdem et al ^[19]	2009	Ghana, Africa	10.80%

Mohammed Abdullah S et al ^[33]	2009	Saudi Arabia	3.80%
Song, Yan et al ^[14]	2010	Western China	0.87%
Al-Rubaye A et al ^[20]	2013	Basra, Iraq	2.50%
Eric Osei et al ^[21]	2014	Ghana, Africa	7.50%
Zhen whang et al ^[22]	2014	Shenzhen, China	2.30%
Abdo AE et al ^[23]	2014	Sudan states	4%
Faisal Mousa Alzahrani et al ^[35]	2015	Dammam, Saudi Arabia	3.24%
Marion Vermeulen et al ^[13]	2015	South Africa	0.66%
Heyredin I et al ^[34]	2018	Eastern Ethiopia	6.60%
Present Study	2020	Pune	0.62%

Table 4 : Comparison of similar international studies

CONCLUSION

It was concluded from the present study that the prevalence of Hepatitis B is showing a decreasing trend among voluntary blood donors when compared to similar studies. Like many other studies conducted in India, the percentage of female donors coming forward for donating blood is still very less. Therefore, more awareness and motivation must be created among them to come forward voluntarily for donating blood. Also, the lowest HBsAg positivity rates was for the age group of 18 to 25 years, praises of which should be given to the effective vaccination program against Hepatitis B in India.

Few innovative laboratories in India check for HBV DNA and more sensitive specific Nucleic Acid Tests (NAT) along with the routine serological markers to detect occult infection thereby increasing the efficiency of screening tests and enhancing the safety of blood products. This is optional. If measures are taken to use NAT testing routinely in all blood banks to detect occult infections it could ensure better safety of blood and blood components. Education of the general population, creating awareness about blood borne infections, mass immunizations, encouragement of blood donations voluntarily and vigorous screening of donors help to achieve reduction in Hepatitis B as well as other blood borne infections thereby ensuring a safe blood supply.

REFERENCES

1. World Health Organization (WHO) Fact sheets, hepatitis B Key Facts. [Updated on July 2018]
2. Centers for Disease Control and Prevention. World Hepatitis Day report. [Updated on July 2018].

3. Blumberg BS, Gerstley BJ, Hungerford DA, London WT, Sutnick AI, A serum antigen (Australia antigen) in Down's syndrome, leukemia, and hepatitis. *Ann Intern Med.* 1967 May; 66(5):924-31.
4. Lok AS, McMahon BJ, Practice Guidelines Committee, American Association for the Study of Liver Diseases Hepatology. 2001 Dec; 34(6):1225-41.
5. Panessa C, Hill WD, Giles E, Yu A, Harvard S, Butt G, Andonov A, Krajden M, Osiowy C Genotype D amongst injection drug users with acute hepatitis B virus infection in British Columbia. *J Viral Hepat.* 2009 Jan; 16(1):64-73.
6. CDC. Recommendations for identification and public health management of persons with chronic hepatitis b virus infection. *MMWR.* 2008;57:9–11.
7. World Health Organization. Blood transfusion safety, Geneva; 2006
8. Jadeja P, Kaur A, Shekha H. Trend in seroprevalence of hepatitis b virus infection among blood donors at a tertiary care centre of Rajasthan, India. *Natl J Med Res* 2014;4:205-7.
9. Puri P. Tackling the Hepatitis B disease burden in India. *J Clin Exp Hepatol.* 2014;4: 312–319.
10. V Bagiyalakshmi, R Gopal, R Siva Elangovan, Prevalence of Hepatitis B Virus Infection among Voluntary Blood Donors at a Tertiary Care Hospital Blood Bank – Tiruchirappalli, *International Journal of Scientific study.* 2017 Jan; 4(10): 105 -108
11. Arora D, Arora B, Khetarpal A. Seroprevalence of HIV, HBV, HCV and syphilis in blood donors in Southern Haryana. *Indian J Pathol Microbiol.* 2010; 53:308–9
12. Bhattacharya P, Chakraborty S, Basu SK. Significant increase in HBV, HCV, HIV and syphilis infections among blood donors in West Bengal, Eastern India 2004–2005. Exploratory screening reveals high frequency of occult HBV infection. *World J Gastroenterol.* 2007; 13:3730–33
13. Marion Vermeulen, Ronel Swanevelder, Dhuly Chowdhury, Charlotte Ingram, Ravi Reddy, Evan M. Bloch, Brian S. Custer, Edward L. Murph, Use of Blood Donor Screening to Monitor Prevalence of HIV and Hepatitis B and C Viruses, South Africa, *EID Journal.* 2017 Sept; 23(9)
14. Song, Yan et al. Prevalence and trend of major transfusion-transmissible infections among blood donors in Western China, 2005 through 2010. *PloS one.* 2014; 9(4)
15. Uneke CJ, Ogbu O, Inyama PU, Anyanwu GI, Njoku MO, Idoko JH. Prevalence of hepatitis-B surface antigen among blood donors and human immunodeficiency virus-infected patients in Jos, Nigeria. *Mem Inst Oswaldo Cruz* 2005; 100: 13– 16.
16. Srikrishna A, Sitalakshmi S, Damodar P. How safe are our safe donors. *Indian J Pathol Microbiol.* 1999; 42:411–16
17. Yashovardhan A., Sreedhar Babu K.V., Jothi Bai D.S., Trend of Hepatitis B Surface Antigen (HBsAg) among blood donors at the blood bank of a tertiary care referral teaching hospital in Southern India”, *Int J Res Med Sci.* 2015 Jul;3(7):1686-1690
18. Fouelifack Ymele F, Keugoung B, Fouedjio JH, Kouam N, Mendibi S, Dongtsa Mabou J: High Rates of Hepatitis B and C and HIV Infections among Blood Donors in Cameroon: A Proposed Blood Screening Algorithm for Blood Donors in Resource-Limited Settings. *J Blood Transfus.* 2012, 2012: 1-7.
19. Julius Tieroyaare Dongdem, Sylvanus Kampo, Ireneous N Soyiri, Patrick Nsobila Asebga, Juventus B Ziem, Kenneth Sagoe, Prevalence of hepatitis B virus infection among blood donors at the Tamale Teaching Hospital, Ghana (2009), *BMC Res Notes* 2012 Feb; (22)5:115.

20. Al-Rubaye A, Tariq Z, Alrubaiy L. Prevalence of hepatitis B seromarkers and hepatitis C antibodies in blood donors in Basra, Iraq. *BMJ Open Gastroenterol.* 2016;3(1)
21. Eric Osei, Sylvester Yao Lokpo and Eric Agboli, Sero-prevalence of hepatitis B infection among blood donors in a secondary care hospital, Ghana (2014): a retrospective analysis, *BMC Res Notes.* 2017 Aug; (10): 391
22. Zhen Wang, Jinfeng Zeng, Tingting Li, Xin Zheng, Xiaoxuan Xu, Xianlin Ye, Liang Lu, Weigang Zhu, Baocheng Yang, Jean-Pierre Allain, Chengyao Li, Prevalence of hepatitis B surface antigen (HBsAg) in a blood donor population born prior to and after implementation of universal HBV vaccination in Shenzhen, China, *BMC Infectious Diseases* 2016 Sept (16):498
23. Abdo AE, Mohammed DA, Satti M. Prevalence of hepatitis B virus among blood donors and assessment of blood donor's knowledge about HBV in Sudan. *HIV/AIDS Res Treat Open J.* 2015; 2(3): 76-80.
24. Smriti Arora. National Immunization Schedule India: A Review. *Research & Reviews: A Journal of Immunology.* 2017; 7(3): 6–10.
25. Sinha RTK, Dey A. Blood Groups and Transfusion Transmitted Diseases - are they Related? *J Med Sci Health* 2017;3(2):9-13.
26. Tyagi S, Tyagi A. Possible correlation of transfusion transmitted diseases with Rh type and ABO blood group system. *J Clin Diagn Res* 2013;7:1930-1.
27. Nigam JS, Singh S, Kaur V, Giri S, Kaushal RP. The prevalence of transfusion transmitted infections in ABO blood groups and Rh type system. *Hematol Rep* 2014;6:71-2
28. Gupta PK, Kumar H, Basannar DR, Jaiprakash M. Transfusion Transmitted Infections in Armed Forces: Prevalence and Trends. *Med J Armed Forces India.* 2006;62(4):348-350.
29. 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 Nov;60(6):389-91.
30. Chandra T, Kumar A, Gupta A. Prevalence of transfusion transmitted infections in blood donors: an Indian experience. *Trop Doct.* 2009 Jul;39(3):152-4.
31. Chandekar SA, Amonkar GP, Desai HM, Valvi N, Puranik GV. Seroprevalence of transfusion transmitted infections in healthy blood donors: A 5-year Tertiary Care Hospital experience. *J Lab Physicians.* 2017;9(4):283-287.
32. Al Waleedi, A.A. & Khader, Y.S. (2012). Prevalence of hepatitis B and C infections and associated factors among blood donors in Aden city, Yemen. *East Mediterr Health J.* 2012 Jun;18(6):624-9.
33. Mohammed Abdullah S. Prevalence of hepatitis B and C in donated blood from the Jazan region of Saudi Arabia. *Malays J Med Sci.* 2013;20(2):41-46.
34. Heyredin I, Mengistie B, Weldegebreal F. Sero-prevalence of transfusion-transmittable infections and associated factors among blood donors in Eastern Ethiopia: an Institutional-based cross-sectional study. *SAGE Open Med.* 2019 Feb 25;7
35. Faisal Mousa Alzahrani, Muzahed, Saeed Sattar Shaikh, Amer Ibrahim Alomar, Sadananda Acharya, Nasreldin Elhadi, Prevalence of Hepatitis B Virus (HBV) Among Blood Donors in Eastern Saudi Arabia: Results From a Five-Year Retrospective Study of HBV Seromarkers , *Ann Lab Med.* 2019 Jan; 39(1): 81–85.