ORIGINAL ARTICLE

Seropositivity and Risk Factors of Hepatitis B in Maharashtra, India

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Abstract:

Background: Hepatitis B is one of the most important infectious diseases worldwide. More than 240 million people have chronic (long term) liver infections. More than 780 000 people die every year due to complications of hepatitis B, including cirrhosis and liver cancer. Hepatitis B is a major public health problem in India. The average carrier rate of Hepatitis B Virus (HBV) in general population is considered to be approximately 4%. *Aim and Objective:* To estimate the seropositivity and to understand dynamics of HBV transmission. *Material and Methods:* The study was conducted from March 2010 to September 2012. Seropositivity of Hepatitis B surface antigen among hospital based general population was determined using a third generation ELISA in the Department of Microbiology, Krishna Institute of Medical Sciences, Karad, Maharashtra, India. A total of 25193 serum samples were screened for HBV infection. *Results:* Out of 25193 samples screened 473(1.87%) serum samples were positive for HBsAg. The mean age of HBsAg positive patient was 40.71 ± 17.46 and mean age of HBsAg negative patients was 34.03 ± 17.51. Prevalence of hepatitis B infection was significantly higher in patients with history of blood transfusion, tattooing, skin and ear piercing, history of dialysis, habit of alcohol, habit of tobacco and occupation. *Conclusion:* There is limited data about blood borne hepatitis i.e. Hepatitis B and Hepatitis C in Western Maharashtra. For prevention and control of hepatitis B raising awareness, promoting prevention of transmission through vaccination, safe injection practices and blood safety and promoting wider access to monitoring, screening, care and treatment services is necessary.

Keywords: Awareness, Hepatitis B, Seropositivity, Prevalence

Introduction:

Hepatitis B is one of the most important infectious diseases worldwide. More than 240million people have chronic (long term) liver infections. More than 780 000 people die every year due to complications of hepatitis B, including cirrhosis and liver cancer [1]. There is wide range of HBV prevalence rates in different parts of the world from 0.1% up to 20%.Low prevalence (< 2%) areas represent 12% of global population and includes Western Europe, the United States and Canada, Australia and New Zealand. In these regions, the lifetime risk of infection is less than 20%.Intermediate prevalence is defined as 2-7% with a lifetime risk of infection of 20-60% and includes the Mediterranean countries, Japan, Central Asia, the Middle East, Latin and South America, representing about 43% of global population. High prevalence areas (≥ 8%) include South East Asia, China, and Sub Saharan Africa, where a lifetime likelihood of infection is greater than 60%.The diverse prevalence rates are probably related to differences in age at infection, which correlates with the risk of chronicity. The progression rate from acute to chronic HBV infection decreases with age and it is approximately 90% for an infection acquired perinatally, and is as low as 5% (or even lower) for adults [2,3].

Hepatitis B is major public health problem in India. The average carrier rate of HBV in general population is considered to be approximately 4%. The professional blood donors constitute a major risk group with a prevalence rate of 14% [4, 5]. Thalassemic and renal dialysis patients also have a high risk of acquiring HBV infection [4, 6]. Some studies have indicated that HBV infection is established in early childhood, probably associated with crowded living conditions and poor hygiene. However, HBV is also associated with acute and sub acute liver failure in adults as well as with a significant proportion of chronic hepatitis, cirrhosis, and hepatocellular carcinoma [4, 7].

Transmission of HBV is predominantly via parenteral means, even though this infection is also transmitted by sexual contact and acu-puncture. Mother-to-child transmission and occupational transmission from HBV infected patients to health care workers are also major modes of transmission. Clinically, HBV infection is indistinguishable from other viral hepatitis. Accordingly, its diagnosis relies on specific laboratory tests. Several viral markers are available for detection of HBV and Hepatitis B surface antigen (HBsAg) is the major viral marker used for the detection of HBV infection [8].

There is limited data on seroprevalence and risk factors for HBV transmission. A tertiary care hospital catering to the needs of a large population represents an important centre for serological survey. The present study was carried out to estimate the seropositivity and to understand dynamics of HBV transmission.

Material and Methods:

The present study was carried out in the Department of Microbiology, Krishna Institute of Medical Sciences, Karad, Maharashtra, India. A total of 25193 serum samples were screened for HBV infection from the patients who registered at the OPDs or were admitted to the Krishna hospital and Medical Research center - a tertiary care teaching hospital and were advised to undergo HBV surface antigen testing were included in the study. Informed consent was obtained.The study was conducted from March 2010 to September 2012. The study approval was obtained from Institutional Ethics Committee.

Data were collected in pre-tested proforma specially designed for this purpose which included identification data and history of addiction i.e. I.V. drug abuse and needle sharing, shaving habits and smoking. Patients were also enquired about history of renal dialysis, blood transfusion and alcohol intake. Females were specially asked about ear piercing.

Blood sample were collected from all patients for the testing of HBsAg. The blood was allowed to clot for 45minutes at room temperature and the serum was separated after centrifugation at a low speed. The serum was then subjected to test. Samples were tested by HBV Kit-ErbaLisa ELISA (Microwell ELISA test for detection of hepatitis B surface antigen (HBsAg) in human serum/plasma, Transasia Bio-Medicals Ltd).All the tests were performed in accordance with manufacturer's instructions with adequate controls and the absorbance of the solution in the wells were read at 450nm within 15 minutes of the

final step by ELISA reader. The reactive samples were retested in duplicates, if found reactive was considered as repeatedly reactive.

Results:

A total of 25193 serum samples were screened for HBV infection in the department of microbiology, Krishna Institute of Medical Sciences, Karad, Maharashtra.

Out of 25193 samples screened 473(1.87%) serum samples were positive for HBsAg. While seropositivity in the year 2010 was 2.26%, 1.83%, in the year 2011 and in the year 2012 it was 1.67%.

In all, 25193 serum samples from different patients were tested for HBsAg detection, among them 9394 (37.3%) were males and 15799 (62.7%) were females. Table 1 shows age and sex wise distribution of the hospital based population with hepatitis B seropositivity.

The seropositivity of HBsAg was 1.87%. The seropositivity for HBsAg among males and females was 2.69 % and 1.39 % respectively. The difference was statistically significant (χ^2=54.102; df=1; p<0.001). The highest seropositivity was found to be among 51-60 years age group of 4.28 % (males 4.72% and females 3.59%). The low prevalence 0.56% was reported in children (< 14 years). The seropositivity was 2.75 % and 2.66 % in 41-50 years and 31-40 years age group respectively. The age group wise difference in seropositivity was statistically significant (χ^2=81.566; df=5; p<0.001). The mean age of HBsAg positive patient was 40.71 ± 17.46 and mean age of HBsAg negative patient was 34.03 ± 17.51. That difference in mean age of positive and negative patient was statistically significant (t=8.26; p<0.001).

Table 1: Age and Sex Distribution of Hospital Based Population with HBsAg Seropositivity

Age (Years)	Number of males tested N (%)	Number of females tested N (%)	Number of males with HBsAg detected (%)	Number of females with HBsAg detected (%)	Total HBsAg positive cases (%)
0-14	690 (7.35)	380 (2.41)	05(0.72)	01(0.26)	6(0.56)
15-30	2612 (27.80)	11473 (72.62)	49 (1.87)	129(0.01)	178(1.26)
31-40	1708 (18.18)	1373 (8.69)	50 (2.93)	32(2.33)	82(2.66)
41-50	1406 (14.97)	913 (5.78)	48 (3.41)	16(1.75)	64(2.75)
51-60	1165 (12.40)	724 (4.58)	55 (4.72)	26(3.59)	81(4.28)
>61	1813 (19.30)	936 (5.92)	46 (2.54)	16(1.71)	62(2.25)
Total	**9394 (100.00)**	**15799 (100.00)**	**253 (2. 69)**	**220 (1.39)**	**473 (1.87)**

All pregnant women attending ANC and/ or delivery services were included. Hence there are higher number of females in the sample in the age group of 15 to 30 years. In all other age group proportion of males are more than females. The prevalence of HBV was lowest for females in 15 to 30 year age group.

Table 2 shows distribution of demographic and transmission risk factors for HBV infection. Prevalence of Hepatitis B infection was significantly higher in patients with history of blood transfusion ($\chi2=4.165$; $p<0.001$), shaving habit i.e. going to barber ($\chi2=59.305$; $p<0.001$), tattooing , skin and ear piercing ($\chi2=14.440$; $p<0.001$), history of dialysis ($\chi2=10.529$; $p<0.001$), habit of alcohol ($\chi2=2.935$; $p<0.001$) habit of tobacco (smokeless and smoke form) ($\chi2=10.499$; $p<0.001$) and occupation ($\chi2=61.577$; $p<0.001$).

While prevalence of hepatitis B infection was not found to be significantly associated with education. ($\chi2=4.118$; $p>0.05$). Backward multivariate logistic regression analysis revealed increasing age, sex (Male), occupation, consumption of alcohol; tobacco chewing, blood transfusion and dialysis were significantly associated with 'HBsAg positivity'.

The Multivariate Logistic Regression (MLR) model with cutoff probability 0.016 (i.e. ≥0.016 indicates HBsAg positive and <0.016 indicates HBsAg negative) could identify 59.7% correct results as compared to results of ELISA. In comparison to ELISA correct identification of HBsAg positive by the MLR model was 62.6% (296 out of 473) while identification of HBsAg negative was 59.6% (14732 out of 24720).

Table 2: Distribution of Demographic and Transmission Risk Factors for HBV Infection

Risk Factors		Number N (%)	HBsAg positive	χ^2 value	p value
H/O Blood transfusion/Blood products	Yes	00738 (2.93)	088(11.3)	4.165	0.000 p<0.001
	No	24455 (97.07)	385(1.6)		
Shaving habit	Yes	02195 (08.71)	088(4.0)	59.305	0.000 p<0.001
	No	22998 (91.29)	385(1.7)		
Tattooing, skin and ear piercing	Yes	06956 (27.61)	094(1.4)	14.440	0.000 p<0.001
	No	18237 (72.39)	379(2.1)		

Contd...

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Risk Factors		Number N (%)	HBsAg positive	χ^2 value	p value
H/O Dialysis	Yes	00049 (0.19)	004(8.2)	10.529	0.000 p<0.001
	No	25144 (99.81)	469(1.9)		
H/O Alcohol	Yes	00247 (0.98)	41(16.6)	2.935	0.000 p<0.001
	No	24946 (99.02)	432(1.7)		
H/O Tobacco	Yes	02777 (11.02)	74(2.7)	10.499	0.001 p<0.001
	No	22416 (88.98)	399(1.8)		
Education	Illiterates and primary	01532 (6.08)	32(2.1)	4.118	0.128 NS
	secondary	10994 (43.64)	225(2.0)		
	College and above	12667 (50.28)	216(1.7)		
Occupation	Housewife	13822 (54.87)	195(1.4)	61.577	0.000 p<0.001
	professional	00270 (1.07)	06(2.2)		
	Semi-professional	00883 (3.50)	32(3.6)		
	skilled	01187 (4.71)	28(2.4)		
	semiskilled	01039 (4.12)	23(2.2)		
	unskilled	05892 (23.39)	162(2.7)		
	student	02100 (8.34)	27 (1.3)		

H/O = History of, NS = Not Significant

Table 3: Multivariate Logistic Regression Model Predicting 'HBsAg Positivity

Study Variable	Regression coefficient	Wald statistics	P value	Odds Ratio	95.0% C.I. for Odds Ratio	
					Lower	Upper
Age	0.014	23.039	0.000	1.014	1.009	1.020
Sex (Male)	0.365	2.899	0.089	1.440	0.946	2.191
Occupation		29.318	0.000			
House wife	0.203	0.504	0.478	1.225	0.699	2.147
Professional	0.149	0.099	0.754	1.160	0.458	2.939
Semiprofessional	0.011	0.001	0.970	1.011	0.555	1.842
Skilled	-0.581	3.759	0.053	0.559	0.311	1.006
Semiskilled	-0.274	0.840	0.359	0.760	0.423	1.366
Unskilled	0.491	4.648	0.031	1.635	1.046	2.555
Alcohol (Yes)	1.027	20.910	0.000	2.793	1.798	4.338
Tobacco (Yes)	0.648	20.582	0.000	1.912	1.445	2.529
Blood Transfusion(Yes)	1.922	146.465	0.000	6.832	5.005	9.326
Dialysis(Yes)	1.049	3.691	0.055	2.854	0.979	8.319
Constant	-5.130	377.245	0.000	0.006		

Discussion:

Out of total 25193 serum samples tested, the seropositivity of HBsAg was found to be 1.87 %(473/25193). While seropositivity was in the year 2010 was 2.26 % and 1.83 %, 1.67 % in the year 2011 and 2012 respectively. A study carried out in hospital based population from Bijapur; Karnataka reported the prevalence of HBsAg was 1.63 % [9].The study carried out at tertiary care centre in Telangana reported seroprevalence of 1.69 % [10]. Another study which was carried out among the patients who were attending the A. J. Hospital Kuntikana, Mangalore, over a period of five years (January 2006-December 2010) reported the seroprevalence of 1.56% [11]. Our study findings correspond to these studies. While Lodha et al did a systematic review of literature and concluded that the true prevalence of hepatitis B in India was 1 to 2% [12].

India has been placed into the intermediate zone of prevalence of hepatitis B (≥2-8%) [13]. A community based study carried out in Tamilnadu reported the prevalence of HBsAg was 5.7% (95% CI 4.7- 6.8) [14].The results of the meta-analysis of true prevalence data of hepatitis B among non tribal population is 2.4 (95 % CI: 2.2 % - 2.7 %).True prevalence among tribal population is 15.9% (95 % CI: 11.4% - 20.4%) [15].

Smita Sood and Shrish Malvankar have reported Seroprevalence of hepatitis B surface antigen of 0.87% in a hospital based population of Jaipur, Rajasthan [16]. Sri Krishna *et al* have reported the prevalence of 1.86% among blood donors of Bangalore [17]. A low prevalence of 0.62% has been reported among blood donors from coastal Karnataka [18].A five years study carried out in rural hospital reported the year wise prevalence ranged from 0.59-1.03% [19].

The prevalence of hepatitis B surface antigen (HBsAg) in the general population varies widely between European countries with intermediate to high HBsAg carrier rates in Turkey (8%) and Romania (6%), followed by Bulgaria (4%), Latvia (2%), and Greece(2%). In the Slovak Republic, Poland, Czech Republic, Belgium, Lithuania, Italy and Germany the HBsAg prevalence was 0.5%-1.5% and in the Netherlands, Estonia, Hungary, Slovenia and Norway below 0.5 % [20,21].

In present study prevalence of HBsAg was significantly higher in males than females. Similar observation was reported by many other studies [9, 16]. There is no explanation for the higher prevalence in males in general population but probably females clear the HBV more efficiently as compared to males [22].

In the present study prevalence of HBV in female population is lower than the male population in all age groups and is lowest in the age group of 15 to 30 years which included all ANCs and/ or delivery cases. As pregnancy and delivery are physiological process and the women have not come to the hospital for any signs or symptoms related to underlying infection or pathology and as a group are different from other OPD patients.

In the present study highest prevalence was found to be among 51-60 years age group in total study population as well as year wise i.e. 2010, 2011, 2012. The hospital based study carried out in Karnataka reported relatively higher percentage of subjects in 6^{th}, 3rd and 2^{nd} decade of life respectively with HBsAg in their sera [9].In present study mean age (40.71± 17.46) of seropositive patients was significantly higher than mean age of seronegative patients (34.03± 17.51). The study was carried out among high risk groups of Pakistani where population the mean age of participants was 41.07 ± 6.06. On average females were significantly ($p< 0.001$) younger than males (38.6 versus 41.4 years) there was no significant difference of age between those who were hepatitis B reactive (42.1± 6.09 years) compared with nonreactive subjects (40.9± 5.97 years) and proportion of Hepatitis B reactive cases was fairly similar across different age categories [23].

In the present study backward multivariate logistic regression analysis revealed increasing

age, sex (male), occupation, alcoholism, tobacco chewing, blood transfusion and dialysis were significantly associated with 'HBsAg positivity'. Prevalence of hepatitis B was found to be significantly associated with increasing age, male sex, while residence, education and occupation were not significantly associated [14]. A study carried out in Uttarakhand showed that persons who have received multiple blood transfusions, history of hepatitis among family members, visits to unregistered medical practitioners and uneducated people are more at risk for acquiring hepatitis B infection [24].

There is limited data about blood born hepatitis i.e. hepatitis B and hepatitis C in western Maharashtra. A recent study in western Maharashtra has reported the seroprevalence of HCV among hospital based population of 0.38 % [25]. Present study has reported the seroprevalence as well as transmission risk factors of hepatitis B infection. For prevention and control of hepatitis B raising awareness, promoting prevention of transmission through vaccination, safe injection practices and blood safety and promoting wider access for monitoring, and screening, as well as care and treatment services are necessary.

References

1. World Health Organization: Hepatitis B. WHO fact sheet. http://www.who.int/mediacentre/factsheets/fs204/en/index.html accessed on 24/08/2015
2. Stevens CE, Beasley RP, Tsui J, Lee WC. Vertical transmission of hepatitis B antigen in Taiwan. *N Engl J Med* 1975; 292:771-4.
3. Wasley A, Grytdal S, Gallagher K. Surveillance for acute viral hepatitis--United States, 2006. *MMWR Surveill Summ* 2008; 57:1-24.
4. Tandon BN, Acharya SK, Tandon A. Epidemiology of hepatitis B virus infection in India. *Gut* 1996; 38 (Suppl 2): S56-9.
5. Chandra M, Khaja MN, Farees N, et al. Prevalence, risk factors and genotype distribution of HCV and HBV infection in the tribal population: a community based study in south India. *Trop Gastroenterol* 2003; 24: 193-5
6. Singh H, Pradhan M, Singh RL, et al. High frequency of hepatitis B virus infection in patients with beta-thalassemia receiving multiple transfusions. *Ox Sang* 2003; 84: 292-9.
7. Agarwal N, Naik S, Aggarwal R, et al. Occult hepatitis B virus infection as a cause of cirrhosis of liver in a region with intermediate endemicity. *Indian J Gastroenterol* 2003; 22: 127-31.
8. Lee JM, Ahn SH. Quantification of HBsAg: basic virology for clinical practice. *World J Gastroenterol* 2011; 17:283-9.
9. Sayed A Quadri, Dadapeer HJ, M Arifulla K, Khan N. Prevalence of Hepatitis B Surface Antigen in hospital based population in Bijapur, Karnataka. Al Ameen J Med Sci 2013; 6(2):180-182.
10. Tripathi PC, Chakraverti TK, Khant NR. Seroprevalence of hepatitis B surface antigen and antibody to hepatitis C virus at a tertiary care centre in Telangana. *Int J Res Med Sci* 2015; 3:297-300.
11. Roche R, Amrita S, Leslie, Nayak R. Prevalence of the Human Immunodeficiency Virus, the Hepatitis B Virus and the Hepatitis C Virus among the Patients at a Tertiary Health Care Centre: A Five Year Study. JCDR 2012, 6(4): 623-626.
12. Lodha R, Jain Y, Anand K, Kabra SK, Pandav CS. Hepatitis B in India: A review of disease epidemiology. *Indian Pediatr* 2001; 38:349-371.
13. Lavanchy D. Hepatitis B virus epidemiology, disease burden, treatment, and current and emerging prevention and control measures. *J Viral Hepat* 2004; 11:97–107.
14. Kurien T., Thyagarajan S.P., Jeyaseelan L., STD Study Group Community prevalence of hepatitis B infection

and modes of transmission in Tamil Nadu, India. *Indian J Med Res* 2005; 121:670–675.

15. Batham A, Narula D, Toteja T, Sreenivas V, Puliyel JM, Systematic review and meta-analysis of prevalence of hepatitis B in India. *Indian Pediatrics* 2007; 44(9): 663–674.
16. Sood S, Malvankar S. Seroprevalence of hepatitis B surface antigen, antibodies to the hepatitis C virus, and human immunodeficiency virus in a hospital-based population in Jaipur, Rajasthan. *Indian J Community Med* 2010; 35:165-9.
17. Srikrishna A, Sitalakshmi S, Damodar P. How safe are our safe donors. *Indian J Pathol Microbiol* 1999; 42:411–416.
18. Singh K, Bhat S, Shastry S. Trend in seroprevalence of Hepatitis B virus infection among blood donors of coastal Karnataka. *India J Infect Dev Ctries* 2009; 3(5):376-379.
19. Das S and Harendra Kumar ML, Viral Hepatitides among the Blood Donors in a Rural Based Hospital: A Five Year Study. *J Clin Diag Res* 2012; 6(4) (Suppl-2): 619-622.
20. Bielawski K, Wlasiuk M, Truskolawska M, Falkiewicz B. HCV infection in Poland. *Arch Med Res* 2000; 31:532-535.
21. Nothdurft HD, Dahlgren AL, Gallagher EA, Kollaritsch H, Overbosch D,Rummukainen ML, et al. The risk of acquiring hepatitis A and B among travellers in selected Eastern and Southern Europe and non-European Mediterranean countries: review and consensus statement on hepatitis A and B vaccination. *J Travel Med* 2007; 14:181-187.
22. Qamer S, Shahab T, Alam S, Malik A, Afzal K. Age specific prevalence of hepatitis B surface antigen in pediatric population of Aligarh, North India. *Indian J Pediatr* 2004; 71:965-7.
23. Memon AR, Shafique K, Memon A, Draz AU , Abdul Rauf MU , Afsar S. Hepatitis B and C prevalence among the high risk group of Pakistani population. A cross sectional study. *Archives of Public Health* 2012, 70:9.
24. Mittal G, Gupta P, Gupta R, Ahuja V, Mittal M, Dhar M. Seroprevalence and risk factors of hepatitis B and hepatitis C virus infections in Uttarakhand, India. *J Clin Exp Hepatol* 2013; 3: 260–300.
25. Patil SR, Ghorpade MV, Patil SS, Shinde RV., Mohite ST. Seroprevalence of Antibodies to the Hepatitis C virus in a Hospital–Based Population: A study from western Maharashtra, India. *IJCR IMPH* 2014; 6(4):102-108.

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