

Research Article

Prevalence of hepatitis-B surface antigen among population of inmates in Tihar Jail, New Delhi

Shweta Rana^{1,2*}, Narinder K. Girdhar³, Manmeet K. Gill¹, Arun Kumar⁴

¹Department of Pathology, SHKM, GMC, Nalhar, Mewat, Haryana, India

²Department of Pathology, Central Jail Hospital, Tihar, New Delhi, India

³Department of Medicine, Central Jail Hospital, Tihar, New Delhi, India

⁴Department of Community Medicine, SHKM, GMC, Nalhar, Mewat, Haryana, India

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*Correspondence:

Dr. Shweta Rana,

E-mail: drshwetarana15@gmail.com

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ABSTRACT

Background: Hepatitis B Virus (HBV), a DNA virus with a human only reservoir, is a worldwide public health problem. Unlike other countries especially Europe and America, there is scarcity of published data on HBV infection among prison inmates in India despite its tremendous importance in public health formulation compared to the general population. The present study was designed to investigate the prevalence of Hepatitis B surface antigen among population of Jail inmates (convicts).

Methods: The study population comprised of all the 1102 prison inmates who were screened for Hepatitis B surface antigen (HBsAg) status using one step immunochromatographic array [INSTACHK Hepatitis-B]. Seroprevalence rate of seropositive was calculated and stratified by age and sex. The seropositives were further subjected to HBeAg and anti-HBe detection, HIV status, anti HCV status, HBV-DNA levels and Liver function tests (LFTs) and the patients were then classified into three groups based on HBV-DNA levels and alanine amino transferase (ALT) levels.

Results: Out of 1102 inmates screened, 30 (2.72%) were HBsAg positive. Slightly higher percentage prevalence of HBsAg was found among males i.e., 3.19% (or 27/844) than females i.e., 1.16% (or 3/258). Out of 30 HBsAg positive cases, 16 were HBeAg negative, 8 were HBeAg positive and 6 refused to get investigated further. Ten of the 16 HBeAg negative cases were further subjected to anti HBe detection. Half of these cases (5) were reactive for anti-HBe. Based on HBV DNA levels and ALT levels, 8 patients were categorized as HBeAg positive chronic hepatitis-B patients, 12 patients were categorized as HBeAg negative chronic Hepatitis-B patients and 4 patients as inactive HBsAg carriers.

Conclusion: HBsAg prevalence among Tihar Jail inmates is comparable to that among the non-incarcerated general population in India.

Keywords: Hepatitis B virus (HBV), Hepatitis B surface antigen (HBsAg), Seroprevalence, Seroconversion

INTRODUCTION

Hepatitis B Virus (HBV) infection is one of the major global health problems. The prevalence of chronic HBV infection continues to be highly variable, ranging from 0.1% in the United States to 20-30% in some Pacific Island nations.¹ Of the two billion people or one third of

the world's population that has been infected with HBV, it is estimated that 360 million people are chronic carriers.²

The global epidemiology of HBV is best reviewed according to the six regions defined by the World Health Organization (WHO): the Americas, Europe, Africa, Eastern Mediterranean, South East Asia and the Western

Pacific. Based on the endemicity (which is defined as the prevalence of Hepatitis B surface antigen (HBsAg) in the general population of that particular geographical area), each geographical area falls in one of the three categories:

- a) High HBV endemicity, where the prevalence of HBsAg is $\geq 8\%$.
- b) Intermediate HBV endemicity, where the prevalence of HBsAg is 1-7%.
- c) Low HBV endemicity, where the prevalence of HBsAg is $< 1\%$.

Approximately 45% of the world's population lives in high endemic areas. Only about 12% of the world's population lives in areas of low endemicity.¹ India is considered in the region of intermediate endemicity. An extensive review by Indian National Association for the study of liver diseases estimated the average national prevalence rate to be 4.7%.³

The data on burden of HBV infection in India come primarily from studies on HBsAg seroprevalence. A large number of studies on the epidemiology of HBV infection have been carried out in India over the last two decades. There are several levels of variability amongst these studies which include the sample size, the methodology for assay of HBV serological markers, the age group covered, general population sample versus blood donors, risk-population samples, ethnicity and geography of the study groups.⁴

Numerous studies have been done on HBsAg prevalence among general population in India. But unlike other countries,^{5,6} especially Europe and America, there is scarcity of published data on HBV infections among prison inmates in India despite its tremendous importance in public health formulation compared to the general population.

Thus keeping in view that prisoners are potential reservoirs of infection to the uninfected entrants and the general population upon regaining freedom, a screening study was carried out in Tihar Jail, New Delhi to determine the seroprevalence of Hepatitis-B surface antigen among jail inmates and among those who are HBsAg positive, the pattern of seropositivity of HBeAg, HIV, Anti HCV reactivity, HBV DNA levels, ALT and other relevant biochemical parameters.

METHODS

The study was conducted in different jail dispensaries of Tihar Jail, New Delhi in the year 2010. Official consent of the highest prison authority was also obtained to carry out the study. All inmates (Convicts) who indicated willingness to participate in the study were included in the study. Inmates of the female jail were also included in the study. Data were collected using self-designed, semi

structured and pretested schedule by conducting face to face interviews and clinical examination /laboratory tests of interest. The test was performed using one step, immunochromatographic assay (INSTACHK Hepatitis-B) for the qualitative detection of hepatitis-B surface antigen (HBsAg) in whole blood which was aseptically collected by finger prick. A record of inmate name, parentage, age and HBsAg status was maintained. All the positive samples were further subjected to HBeAg and anti-HBe detection, HIV status, anti HCV status, HBV-DNA levels, LFTs. The data so collected were entered on Excel spreadsheet, collated and analyzed to bring out the results and draw conclusions. The patients with abnormal ALT levels (HBeAg positive or negative) were further subjected to ultrasound examination, α -fetoprotein levels and biopsy and the treatment protocol was decided.

RESULTS

Out of total 1102 inmates screened for HBsAg, 30 were tested positive, i.e., 27 were males and 03 were females.

The overall prevalence of HBsAg among the study prison inmates aged 18 to 80 years was 2.72% (n=1102). The prevalence of HBsAg in males was 3.19% (27/844) compared to 1.16% (3/258) in females.

Out of total 30 HBsAg positive cases, 27 were further subjected to HBeAg and anti-HBe detection, HIV status, anti HCV status, HBV-DNA levels and LFTs. None tested positive for Anti HCV or HIV. The three HBsAg positive female inmates refused to get investigated further.

Out of 27 HBsAg positive cases, 16 were HBeAg negative, 8 were HBeAg positive and three refused to get investigated further. Ten of the 16 HBeAg negative cases were further subjected to anti-HBe detection. Half of the cases (5) were reactive for anti-HBe. The study subjects were classified into three groups based on HBV-DNA levels and ALT levels.

- i. HBeAg positive chronic hepatitis B patients.
- ii. HBeAg negative chronic hepatitis B patients.
- iii. Inactive HBsAg carriers.

Four cases were categorized as inactive HBsAg carriers by the absence of HBeAg, low levels of HBV DNA with PCR based assay (Real time PCR with fluorescein taqman probe, HBV DNA < 10000 copies/ml), repeated normal ALT levels and no signs and symptoms of liver disease.

Out of these four cases only one case was subjected to anti HBe detection and was found to be reactive. Rest three refused for the investigation but were categorized as inactive carriers on the basis of low HBV DNA levels and normal ALT levels.

Table 1: Age and sex wise distribution of HBsAg positivity among the study jail inmates.

Age group	Males			P value	Females			P value
	Positive	Negative	Total		Positive	Negative	Total	
18 - 25	3	109	112	0.973*	0	35	35	0.958 [#]
26-50	21	594	615		3	183	186	
>50	3	114	117		0	37	37	
Total	27	817	844		3	255	258	

*Chi square test was applied; [#] Chi square test with Yate's correction was applied

Table 2: Pattern of seropositivity of biological markers and levels of biochemical parameters among three classified groups of HBsAg positive study subjects.

Biological/biochemical parameter	Chronic hepatitis B patients		Inactive HBsAg carriers	P value
	HBeAg(+ve) 8	HBeAg(-ve) 12	HBeAg(-ve) 4	
HBeAg status	Positive	Negative	Negative	#
ALT (IU/L) [Range]	(10-63)	(26-116)	(29-35)	0.777
HBV-DNA level (Copies/ml) [Range]	(700-4887.5x10 ⁶)	(<100-18075x10 ⁶)	(<100-4550)	0.593
HIV	Positive	-	-	#
	Negative	6	12	
Anti HCV	Reactive	Nil	Nil	#
	Non-reactive	8	12	
Serum protein (g/dL)	7.2 ± 0.6	7.3 ± 0.5	7.6 ± 0.4	0.634
Serum albumin (g/dL)	3.8 ± 0.6	4.1 ± 0.6	4.1 ± 0.8	0.620
Serum bilirubin (mg/dL)	0.8 ± 0.2	1.0 ± 0.6	0.8 ± 0.3	0.713

#P value was not calculated because of insufficient number in the cells

DISCUSSION

The prevalence of chronic Hepatitis B infection is variable throughout the world, ranging from <1% in areas of low endemicity upto 30% in highly endemic areas. There has been an overall decline in the prevalence of the disease due to global infant childhood vaccination programs, post exposure prophylaxis and anti-viral therapy. As a result of global vaccination programs many countries in Asia (including India) that once had high rates of HBV infection are now classified as intermediate endemic areas.¹ In 1975, an international collaborative study organized by WHO assessed the prevalence of HBsAg in different parts of the world. High HBsAg prevalence was detected in African and Asian countries such as Egypt, India, Senegal, Thailand and Uganda.⁷ In areas of high HBV endemicity, the usual mode of transmission is vertical at the time of birth from a chronically infected mother or horizontal in early childhood from bites, skin lesions or unsanitary habits. The most common mode of transmission in areas of low endemicity is horizontal in adulthood, usually through sexual transmission and the use of contaminated needles in medical procedures or injection drug use.^{1,8}

Hepatitis B virus is estimated to be the cause of 30% of cirrhosis and 53% of liver cancer in the world.⁹

There are 8 genotypes of HBV, A through H, each with a distinctive geographical distribution. Genotype B and C are most common in Asia.^{10,11} The prevalence of Hepatitis-B surface (HBsAg) in India ranges from 1 to 13%, with an average of 4-7 percent.^{4,12-19} Higher rates of HBsAg prevalence have been noted in tribal population of India.²⁰⁻²² Joshi et al.²⁰ reported a prevalence of 15.7% in tribal areas of Madhya Pradesh. Jain et al.²¹ found a prevalence rate varying from 5.9% to 10.5% among various tribal populations in Udaipur district of Rajasthan. Murhekar et al.²² reported an alarming prevalence of >60% among the Jarawas tribe of Andaman and Nicobar Islands.

Prisoners worldwide continue to demonstrate a significantly higher prevalence of HBV infections.^{5,6,23} Macalino et al.⁵ reported prevalence of 20.2% in Rhode Island prisons. Adoga et al.⁶ reported prevalence of 23% among prison inmates in Nasarawa State, Nigeria. Singh et al.²³ reported prevalence of 11.1% in men and 22.2% in women jail inmates of a district jail in Northern India.

Our study showed intermediate overall HBsAg prevalence of 2.72% which is comparable to the HBsAg prevalence among general population in India. Behal et al.⁴ reported an overall HBsAg prevalence of 2.25%, prevalence of 2.28% in males and 1.3% in females among general population in Northern India and maximum prevalence of HBsAg at 3.10% in male donors aged 35-45 years. Our study also showed slightly higher prevalence of HBsAg, 3.19% in male inmates as compared to female inmates, 1.16% and showed maximum prevalence of 6.45% in male convicts aged 56-60 years. However the differences were not found to be statistically significant (Table 1). None of our subjects admitted to having ever injected drugs.

Presence of HBsAg, HBeAg and high DNA levels for greater than 6 months implies chronic infection. A key event in the natural history of progression of HBV infection is HBeAg seroconversion to HBeAb with marked reduction of HBV replication followed by gradual histological improvement.²⁴

In our study, HBV-DNA levels for most of HBeAg positive patients were higher than HBeAg negative ones and similar trend was observed between HBeAg negative Chronic hepatitis B patients and inactive carriers which is in accordance to that observed by Changotra et al.²⁵ HBeAg negative carriers are a heterogeneous group, most of them have low viral DNA levels, relatively normal levels of ALT, a fair prognosis,²⁶ (Table 2). In our study, two out of twelve (i.e., 16.6%) HBeAg negative chronic hepatitis B patients, who were also non-reactive for anti-HBe, demonstrated high HBV DNA levels (18075×10^6 copies/ml), high ALT levels (116 IU/L) respectively. Funk et al.²⁶ noted that 15-20% of HBeAg negative carriers have elevated ALT and viral DNA levels.

A proportion of patients who undergo HBeAg seroconversion demonstrate a recurrence of high HBV DNA levels and intermittent or persistent ALT level elevations. These individuals have a naturally occurring mutant form of HBV that does not produce HBeAg due to a mutation in the precore and core promotor region.²⁷

CONCLUSION

HBsAg prevalence among Tihar Jail inmates is comparable to that among the non-incarcerated general population in India. However, further multicentric seroprevalence studies are recommended to generalize the findings to other Jails.

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