Original Article

Prevalence of hepatitis B and C virus infections among Buddhist tribes of Kaza health block, Lahaul and Spiti district of Himachal Pradesh

RAJESH SHARMA, ANMOL GUPTA, NEETU SHARMA, AMIT SACHDEVA, DEEPESH BARALL, VISHAL BODH, DIKSHANT SHARMA, BRIJ SHARMA.

ABSTRACT

Background. Infection of hepatitis B virus (HBV) and/or hepatitis C virus (HCV) is a global public health concern. We aimed to estimate the prevalence of viral hepatitis B and C in the Buddhist tribal area of Kaza health block in Lahaul and Spiti district in Himachal Pradesh, India, and to identify the determinants.

Methods. The study was conducted by the departments of Gastroenterology, Community Medicine and Microbiology, Indira Gandhi Medical College, Shimla between June 2015 and October 2017. Using a two-stage sampling method, 4231 participants in 40 clusters were enrolled. For each subject, a pre-tested interview schedule was administered, and blood was tested for hepatitis B surface antigen (HBsAg) and antibodies to HCV (anti-HCV). Those samples which tested positive for HBsAg were further tested for hepatitis B core antigen (HBeAg) and antibody to HBeAg (anti-HBe).

Results. Among the 4231 participants, HBsAg and anti-HCV were detected in 961 (22.7%) and 33 (0.9%), respectively, including 6 (0.1%) who tested positive for both. HBsAg positivity was not associated with religion (p = 0.07), caste (p = 0.16), level of education (p = 0.58) or marital status (p = 0.73). Of all the participants, 588 (13.9%) reported a history of HBV vaccination. Of those who were HBsAg positive (961), 21.6% were positive for HBeAg and 58.3% were positive for anti-HBe.

Conclusion. The prevalence of HBV infection in the Kaza health block was high, and no specific associations were identified. Interventions such as public health education and universal childhood immunization at birth may help reduce the high rate of transmission of HBV in this population.

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Indira Gandhi Medical College, Department of Gastroenterology, Shimla 171001, Himachal Pradesh, India
RAJESH SHARMA, VISHAL BODH, BRIJ SHARMA Department of Gastroenterology
ANMOL GUPTA, AMIT SACHDEVA Department of Community Medicine
NEETU SHARMA Department of Physiology

Dr Rajendra Prasad Government Medical College, Tanda 176001, Himachal Pradesh, India
DEEPESH BARALL Department of Community Medicine

Pandit Jawaharlal Nehru Government Medical College, Chamba 176310, Himachal Pradesh, India
DIKSHANT SHARMA Undergraduate student

Correspondence to BRIJ SHARMA; *drbrijsharma01@gmail.com*

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INTRODUCTION

Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections are major public health issues, with an estimated 35 crore (350 million) and 17 crore (170 million) infected persons worldwide, respectively. The number of persons with these infections in India is estimated to be 4–5 crore (40–50 million) and 60 lakhs–1.2 crore (6–12 million), respectively.[1–3]

The two viruses have many similarities including modes of transmission, hepatic tropism and the ability to cause chronic infection that may result in liver cirrhosis and hepatocellular carcinoma. Some geographic regions have very high prevalence of these infections; such areas need a concerted implementation of preventive and treatment strategies.

Kaza health block in Lahaul and Spiti district has a population of 12 547 and the health institutions in the block include 1 community health centre (CHC), 5 primary health centres (PHCs) and 10 health sub-centres. As more than 200 persons with HBV infection from the Lahual and Spiti district had reported to the Department of Gastroenterology at the Indira Gandhi Medical College (IGMC) over a 3-year period,[4] we decided to estimate the prevalence of HBV and HCV infections in the residents of this region; as well as to find out the determinants for the occurrence of these infections.

METHODS

The study was conducted by the departments of Gastroenterology, Community Medicine, and Microbiology, IGMC, Shimla, between June 2015 and October 2017. It consisted of a cross-sectional survey in the Kaza health block of the Lahaul and Spiti

district to estimate the prevalence of HBV and HCV infections, and a case–control study to identify the risk factors for HBV infection. As per the 2011 census, Kaza block had a population of 12 547: including 6691 males and 5766 females. It has 11 village panchayats.

The required sample size, calculated assuming an HBV prevalence of 16% with 95% confidence limits and 2% precision and design effect of 3.0, was 3864 (i.e. approximately 4000). We did a 2-stage cluster-randomized sampling. In the first stage, all the villages in Spiti area along with their population were listed in alphabetical order, and 40 of these were selected using the probability proportionate to size approach. This was followed by enrolment of 100 study subjects in each selected village using simple random sampling.

Each identified subject was administered a pre-tested interview schedule by one of the trained health workers or a field investigator (selected from the inhabitants of the Spiti area). The data elements in it included a complete history of illness (if any), and risk behaviours associated with a high risk of HBV/HCV infection. Further, for each subject, a 5 ml sample of blood was collected and transported (in cold chain) to the Department of Microbiology, IGMC, Shimla. The blood samples were first tested for the presence of hepatitis B surface antigen (HBsAg) and antibodies to HCV (anti-HCV) using commercially available kits, specifically the Microlisa HBsAg and HCV kits (J Mitra & Co, New Delhi, India). The specimens that tested positive for HBsAg were further tested for hepatitis B core antigen (HBeAg) and antibodies to HBeAg (anti-HBe), using Accu-Tell® HBeAg Elisa test kit (AccuBioTech, Beijing, China).

Data were analysed using EpiInfo version 7.1.2 for Windows (*www.cdc.gov/epiinfo*; Centers for Disease Control and Prevention, Atlanta, GA, USA). In brief, the baseline characteristics were summarized using proportions and 95% confidence interval. To identify the factors associated with the presence of HBsAg, bivariate analyses were done using: HBsAg-positive participants (as cases) and, age- and sex-matched HBsAg-negative participants as controls; two controls per each case were analysed. p values ≤ 0.05 were considered significant.

The study was approved by the Institutional Ethical Committee, IGMC, Shimla [permission letter number HFW(MS) G-5 (Ethics)/2014-5257]. Informed written consent was obtained from the participants (or from parents if the participant's age was <18 years). Those found to have HBV or HCV infection were referred to the Department of Gastroenterology at IGMC, Shimla for appropriate management.

RESULTS

A total of 4238 participants were enrolled. However, the information was incomplete for 7 participants, and hence 4231 were included for final analysis (Table I).

The prevalence of HBsAg positivity was 22.7%, and that for anti-HCV was 0.9% (Table II), with 0.1% being positive for both the markers . Of the 4231 participants, 588 (13.9%) reported having received HBV vaccination.

Of the HBsAg positive persons who could be tested, HBeAg was positive in 21.6% and anti-HBe was positive in 58.3% (Table II).

The case–control analysis of risk factors for HBsAg status was done using 962 HBsAg positive participants (as cases) and age- and sex-matched HBsAg-negative participants as controls (two controls for each case, i.e. a total of 1924 controls). In this analysis, HBsAg status did not show significant relationship with any of the assessed factors namely: sex, age, religion, caste, level of education, marital status or occupation (Table III).

TABLE I. Sociodemographic profile of the study population

Variable	*n* (%)
Sex	
Male	1721 (40.7)
Female	2510 (59.3)
Age group (years)	
0–10	461 (10.9)
11–20	957 (22.6)
21–30	681 (16.1)
31–40	793 (18.7)
41–50	718 (17.0)
51–60	369 (8.7)
>60	252 (5.9)
Religion	
Buddhism	4202 (99.3)
Hindu	24 (0.6)
Others	5 (0.1)
Caste	
Scheduled tribe	4163 (98.4)
Scheduled caste	51 (1.2)
Other backward class	4 (0.1)
General	9 (0.2)
Do not know	4 (0.1)
Education	
No formal education	781 (18.5)
1st–5th class	1045 (24.7)
6th–8th class	757 (17.9)
9th–10th class	581 (13.7)
10th–12th class	775 (18.3)
Graduate and above	292 (6.9)
Marital status	
Never married	1550 (36.6)
Currently married	2273 (53.7)
Married but not co-habiting	18 (0.4)
Widow/divorced/separated	154 (3.6)
Monk/Nun	236 (5.6)
Occupation	
Professional	49 (1.2)
Clerical/sales	51 (1.2)
Service	594 (14.0)
Shopkeeper/business	26 (0.6)
Skilled/unskilled manual worker	81 (1.9)
Agriculture	863 (20.4)
Domestic worker	103 (2.4)
Unemployed	46 (1.1)
Student	1341 (31.7)
Housewife	712 (16.8)
Other	365 (8.6)
Currently living with	
None	69 (1.6)
Spouse	803 (19.0)
Sexual partner other than spouse	11 (0.3)
Friends	433 (10.2)
Family/relative other than sexual partner	2915 (68.9)

DISCUSSION

Our study showed a high (22.7%) prevalence of HBV infection in the Kaza health block in Lahaul and Spiti district of Himachal Pradesh, whereas the prevalence of HCV was similar to that

TABLE II. Prevalence of hepatitis B and C virus infection among the population of Kaza health block, Lahaul and Spiti district of Himachal Pradesh

Marker	Number positive/number tested (%)
Hepatitis B surface antigen (HBsAg)	962/4231 (22.7)
Antibodies to Hepatitis C virus (anti-HCV)	39/4231 (0.9)
Both HBsAg and anti-HCV	6 (0.1)
Hepatitis B core antigen (HBeAg) positive*	186/860 (21.6)
Antibody to HBeAg (Anti-HBe) positive*	501/859 (58.3)

*Among HBsAg positives

TABLE III. Relationship of risk factors with Hepatitis B surface antigen (HBsAg) positive status

Variable	HBsAg positive (n=962)	HBsAg negative (n=1924)	p value
Sex			
Male	417	834	
Female	545	1090	
Age group (years)			
0–10	74	148	
11–20	153	308	
21–30	151	300	
31–40	191	382	
41–50	210	421	
51–60	114	227	
>60	76	150	
Religion			
Buddhism	950	1915	0.07
Hindu	9	7	
Others	3	2	
Caste			
Scheduled tribe	943	1897	0.06
Scheduled caste	15	21	
Other backward class	1	1	
General	0	4	
Do not know	3	1	
Education			
No formal education	179	414	0.058
1st-5th class	247	456	
6th-8th class	155	315	
9th-10th class	130	241	
10th-12th class	175	348	
Graduate and above	76	150	
Marital status			
Never married	291	565	0.73
Currently married	574	1170	
Married but not co-habiting	5	9	
Widow/divorced/separated	37	85	
Monk/Nun	55	95	
Occupation			
Professional	11	24	0.39
Clerical/sales	13	21	
Service	160	334	
Shopkeeper/business	9	13	
Manual worker	14	50	
Agriculture	228	449	
Domestic worker	25	56	
Unemployed	12	20	
Student	229	465	
Housewife	169	357	
Other	92	135	
Currently living with			
None	22	43	0.76
Spouse	201	390	
Sexual partner other than spouse	0	3	
Friends	78	176	
Family/relative other than sexual partner	661	1312	

The cases and controls were age- and sex-matched; two controls were selected for each case

reported elsewhere in the country. No specific factors were identified as being associated with HBV infection.

HBsAg positivity rate in most of the hospital-based or blood bank studies in India ranged between 2% and 8%.[1] Lodha *et al*. in a systematic review of data on HBV infection in India reported the prevalence of HBsAg to be between 1% and 2%.[5] Further, in a large population-based epidemiological study in Birbhum district of West Bengal the prevalence of HBsAg was 2.9%.[6] However, in another meta-analysis, the prevalence was 2.4% in non-tribal populations and 15.9% among tribal populations.[7] Similarly high rates have been reported in Idu Mishmi tribe (21.2%) in Arunachal Pradesh[8], and Nicobarese (23.3%) Shompen (37.8%) and Jarawa (65%) tribes in Andaman and Nicobar.[9,10] Joshi *et al.* found a HBsAg rate of 2.99%–21.54% in tribal populations in Madhya Pradesh.[11] Thus, our finding of 22.7% prevalence of HBV is not surprising since we too studied a tribal population.

The Kaza health block is inhabited by a Tibetan tribe which has its ancestral roots in the Lhobha tribe of Tibet.[8] The prevalence of HBsAg is known to be high among the Tibetan tribes, and thus this linkage may explain the high HBV endemicity rate in our study. This high rate of transmission of HBV infection is thought to be maintained through mother-to-child transmission, and possibly by close quarter living, tribal customs, illiteracy and poor exposure to healthcare resources.[12] A previous study has also reported a high prevalence (17.2%) of HBV in Spiti valley of Himachal Pradesh.[4]

The prevalence of anti-HCV antibody in our population was 0.9%. This was similar to the data from a large meta-analysis of 327 studies, in which the prevalence rate of anti-HCV in India was estimated as 0.85% in community studies, 0.44% among asymptomatic blood donors, and 0.88% among pregnant women.[13]

We did not find any relationship of any of the factors studied with HBsAg status. Importantly, the HBsAg positivity rates were similar across all ages and were quite high even in the first year of life. This indicates that the most likely route of transmission in our study population was early-life transmission from mother-to-child. The HBeAg positivity rate among HBV-infected persons in our study was higher than the 7.8% reported among HBV-infected pregnant women in northern India.[14] This too supports the importance of mother-to-child transmission in this population.

Vaccination against HBsAg was received by 13.9% of the population and it was negatively associated with HBsAg positivity. However, the fact that HBV vaccination was introduced in India during 2005–2010, i.e. only a few years before our study began in 2015 and, this being a remote area with possible low vaccination coverage, and that children in their first decade of life form only a small proportion of our sample, may explain a high rate of HBV infection observed in our study. Further, our cases and controls being matched for age, the case–control analysis would not be expected to show any decline in HBV infection in the youngest age group.

In conclusion, there was a high endemicity of HBV infection in the region studied, and no specific risk factors could be identified. Steps to increase public awareness about the routes of transmission of this infection and HBV vaccination may help control the transmission of HBV in this population.

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