

# Seroprevalence and Risk Factors of Hepatitis B Virus Infection among the General Population in Ladakh Region of Northern India

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## ABSTRACT

**Introduction:** Hepatitis B Virus (HBV) infection remains a major global public health problem claiming more than a million lives every year. Data on prevalence of hepatitis B infection among the general population of Ladakh region of Northern India is lacking. We aimed to ascertain the prevalence of hepatitis B infection in the region and its associated risk factors.

**Material and methods:** It was a community based cross sectional study. A total of 1997 subjects from all blocks of Leh and Kargil districts were screened for Hepatitis B surface antigen (HbsAg) through stratified random sampling. All the sera were tested for HbsAg by Enzyme-linked immunosorbent assay (ELISA) method using HBsAg ELISA Test Kit. Seroprevalence was calculated and stratified by age, sex and exposure history to risk factors.

**Results:** Out of the 1997 subjects screened 84(4.2%) tested positive for HBsAg. Higher prevalence of HbsAg was found from Kargil district (7.40%) than leh district (1.96%) (Statistically significant,  $P = 0.0001$ ). The age specific prevalence of HbsAg positivity was maximum (6.04%) in subjects aged 21-40 years. Also higher prevalence of HbsAg was seen among males (4.86%) than females (3.78%). HbsAg was more prevalent in persons with family history of jaundice than those without family history of jaundice ( $P = .050$ ). Factors not found to have association with increased prevalence of hepatitis B were history of receiving blood transfusion, history of shaving at barber shop, past history of jaundice.

**Conclusion:** The prevalence of HBV infection in Ladakh region is slightly higher than the national average prevalence with significant local variations. Apart from family history of jaundice, no significant risk factors were found.

**Keywords-** Hepatitis B Virus; Hepatitis B Surface Antigen; Epidemiology; Population; Ladakh; Jammu and Kashmir;

far East and South Africa, HBV infection occurs in 5-10% of the general population.

Based on the prevalence of HBV surface antigen (HBsAg) carrier rate in the general population, the Sub-Saharan, African, East Asian and Alaskan populations are classified as having high HBV endemicity (HBsAg carriage  $>8\%$ ), while the populations of southern parts of Eastern and Central Europe, the Amazon basin, the Middle East and the Indian Subcontinent are classified as intermediate HBV endemicity (HBsAg carriage 2-7%), and the populations in western and northern Europe, North America, and Australia are classified as low HBV endemic (HBsAg carriage  $<2\%$ ) regions.<sup>2</sup>

India falls in the region of intermediate endemicity, with 3-4% of the population infected with the virus with high rates exceeding 10% among certain tribes.<sup>3,4</sup> Over the last two decades a large number of studies have been carried out to ascertain the epidemiology of HBV in India. However many of these studies have several drawbacks including inadequate sample size, the methodology for assay of HBV serological markers, the age group studied, general population sample versus blood donors, ethnicity and geography of the study groups.

Based on hospital data, the prevalence of HBV infection in areas of Leh and Kargil districts of J&K State seems to be high. An earlier study had found the prevalence of HBsAg positivity among a population of 144 in Ladakh of 9.72%.<sup>5</sup> However no large population based study has been done afterwards. With this background we conducted the present study to ascertain the epidemiology of HBV infection in the Region.

## MATERIAL AND METHODS

### Areas of Study

The Indian State of Jammu and Kashmir consists of three

## INTRODUCTION

Hepatitis B Virus (HBV) infection remains a major global public health problem, despite of the availability of an effective vaccine and potentially effective antiviral therapy. According to global survey more than 2 billion people have evidence of past or current HBV infection and more than 350 million of populations have developed chronic HBV infection causing about 1 million HBV related death each year.<sup>1</sup> The prevalence of HBV infection varies markedly among different geographic regions of the world. In developed countries like Northern Europe and America, HBV infection occurs in less than 1% of the population whereas in developing countries of Asia and Africa, particularly those of

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regions, the Kashmir valley, Jammu and Ladakh. Ladakh comprises of two districts; Leh and Kargil lying at an altitude ranging from 8000-16000 feet above sea level. The topography of the region is mountainous with little or no vegetation. The terrain being hilly, available land for agriculture is meagre. The villages are distant with scarce population spread over a vast area. Leh district is divided into 6 blocks consisting of 112 inhabited villages and one un-inhabited village. The total population of Leh district is 1, 47,104. Kargil district comprises 7 blocks with 127 inhabited villages and 2 un-inhabited villages. This district has a population of 1, 43,300. Hence it was not possible to screen each house and each individual for HBV infection by serology. <sup>5</sup> Thus the study was designed to collect representative information from each block.

### Study Population

A total of 1997 subjects from all Blocks of Leh and Kargil districts participated in the study. Twenty villages out of all the blocks were selected. These villages in each block of Leh and Kargil were arranged alphabetically and assigned a numerical digit in ascending order and the villages in each block were selected randomly by computer generated sequence of random numbers. The screening was done in collaboration with local health authorities and local bodies. Announcement regarding the date of awareness cum screening camp block wise was made public through local media (Print & Electronic) and health workers. The camps were organized at the District hospital, sub district hospital and Primary Health Centre. A brief lecture in local language regarding HBV infection, spread, prevention and need for blood samples was delivered followed by screening and collection of blood samples. Structured questionnaires were given to all the participants. Information from these questionnaire included demographics, education, exposure history to risk factors of hepatitis B was filled and coded by trained interviewers. Three millilitre venous blood samples were collected from each subject under all aseptic precautions. All the blood samples were centrifuged within 10 minutes at respective health centre and all the sera were separated and stored at -20°C and later transported frozen to Laboratory at Srinagar (Kashmir) and stored in deep freezer till samples were analysed.

### Serological Testing

All the sera were tested for HBsAg by Enzyme- linked immunosorbent assay (ELISA) Method using HBsAg ELISA Test Kit (Microscreen) manufactured by Span Diagnostics Ltd. Microscreen can detect up to 0.1ng HBsAg /ml in terms of sensitivity and has a specificity of 100%.

### STATISTICAL ANALYSIS

Continuous variables were analyzed in the form of mean and standard deviation while categorical variables were summed up as frequency and percentages. Categorical variables were analyzed by using Chi-Square Test. Calculated P-value <0.05 is considered significant. Fisher's exact test was used wherever Chi-square test did not meet the Cochran

criteria. Difference between 2 means was analyzed using the unpaired *t* test.

### RESULTS

A total of 1,997 subjects (1,150 from Leh and 824 from Kargil districts) participated in the study. There were more females (60.82%) than male (39.19%) in our study (Table1). Age of participants ranged from 2-90years with Mean of  $34.07 \pm 18.32$  years and majority belonged to age group of 21-40 years (Table 2). About 33.3% of the participants were students followed by housewives (25.1%), farmers (22.3%), government employees (7.9%), health care workers (8.0%), and labourers (2.9%).

The overall prevalence of HBsAg was 4.2% (84/1997) among

District	Female	Male	Total
Kargil	454	370	824
Leh	763	410	1173
Ladakh (Total)	1217	780	1997

**Table-1:** District wise population distribution of the studied region

Age group	Number of patients		
	Total (%)	Male (%)	Female (%)
1-10	116 (5.8)	51 (44)	65 (56)
11-20	474 (23.7)	185 (39)	289 (61)
21-30	393 (19.7)	157 (40)	236 (60)
31-40	344 (17.2)	130 (37.8)	214 (62.2)
41-50	297 (14.9)	103 (34.7)	194 (65.3)
51-60	187 (9.4)	76 (40.6)	111 (59.4)
61-70	119 (6.0)	53 (44.5)	66 (55.5)
71-80	55 (2.7)	22 (40)	33 (60)
81-90	12 (0.6)	05 (41.7)	07 (58.3)
Total	1997 (100)	782 (39.2)	1215 (60.8)

**Table-2:** Age and Gender distribution of study population

	HBsAg Negative (n)	HBsAg Positive (n)	HBsAg Positive (%)
Male	744	38	4.86
Female	1169	46	3.78
Total	1913	84	4.20

**Table-3:** Hepatitis-B seroprevalence in association with Sex

Age group (years)	HBsAg Status			% HBsAg +
	Negative	Positive	Total	
1-10	115	1	116	0.80%
11-20	465	9	474	1.90%
21-30	372	21	393	5.34%
31-40	323	21	344	6.10%
41-50	283	14	297	4.71%
51-60	177	10	187	5.34%
61-70	111	8	119	6.72%
71-80	55	0	55	0.00%
81-90	12	0	12	0.00%
Total	1913	84	1997	4.20%

**Table-4:** Hepatitis- B Seroprevalence in association with age.

Risk factors	Number (%)	HBsAg+(%)	HBsAg-(%)	P-Value
Family history of HBV infection/jaundice	73(3.6)	7(9.6)	66(90.4)	0.050
Blood transfusion	48(2.4)	3(6.2)	45(93.8)	0.328
Shaving beard/hair at barber's shop	222(11.1)	13(5.8)	209 (94.2)	0.194
Surgical procedure	219(11.0)	12(5.5)	207(94.5)	0.203
Visit outside state	279(14.0)	15(5.4)	264(94.6)	0.185
Injection/needle prick	793(39.7)	27(3.4)	766(96.6)	0.148
Past history of jaundice	97(5.0)	5(5.2)	92(94.8)	0.194

**Table-5:** Risk factors of Hepatitis B infection in study population.

the general population of Ladakh. Prevalence of HBsAg was higher 7.4% (61/824) in Kargil district compared to 1.9% (23/1173) in Leh district. The difference is statistically significant ( $P=0.0001$ ). The seroprevalence of Hepatitis B infection was 4.86% in males compared to 3.78% in females (Table 3). However the difference was statistically insignificant. The prevalence of HBsAg positivity varied significantly with age. It increased from 0.80% in subjects less than 10 years, to 6.10% and 6.7% in age group of 31-40 years and 61-70 years respectively and, there after decreasing among people above 70 years age group (Table 4). Regarding the risk factors, family history of hepatitis B infection or jaundice was significantly associated with Hepatitis B infection. Prevalence of HBsAg was relatively higher in persons with risk factors such as history of blood transfusion, history of shaving beard and hair at barber's shop, use of unsterilized blades in males, history of visiting outside state, history of surgery and history of jaundice, but did not show statistical significance (Table 5).

## DISCUSSION

This is one of the first large community based study in Ladakh region of Jammu and Kashmir State. Ladakh region is a small town located at an isolated land of Jammu and Kashmir State at an altitude ranging from 8000-16,000 feet above sea level. It is largely a desolate cold desert, rugged terrain with little vegetation on the mountains along the bank of rivers and its tributaries. The area remains cut off from the rest of the state during winter time due to heavy snow fall.

The overall seroprevalence of hepatitis B in our study is 4.20%. The prevalence was slightly higher than the national prevalence of HBV infection of 3-4 percent.<sup>3,4</sup> However the frequency of HBsAg sero-positivity was lower than that many Indian states like West Bengal (5.3%)<sup>6</sup> and Tamil Nadu (5.7%)<sup>7</sup> and Maharashtra<sup>8</sup>. Similar prevalence of hepatitis B has also been reported from neighbouring country of China (4.04%)<sup>9</sup> while a study from Bangladesh revealed a higher prevalence(5.5%).<sup>10</sup> So Ladakh region of Jammu and Kashmir region falls under intermediate endemicity zone category for HBV infection (2-7%) as per geographic distribution globally<sup>2</sup>.

We found significantly higher prevalence of Hepatitis B virus infection 7.4% in Kargil district compared to 1.96% in Leh district. This makes the Kargil belt an intermediate to high endemicity zone. This may partly be explained by the fact that Kargil district is densely populated (10/sq.km.) as compared to Leh (3/sq.km.). So there is tendency for

overcrowding, poor hygiene and possible prolonged contact with HBsAg positive cases. Mudawi et al<sup>11</sup> and Cisneros-castolo et al<sup>12</sup> also observed that overcrowding and poor hygiene are risk factors for local transmission of hepatitis B. Also Kargil district is inhabited by large majority of Shia Muslims with minority of Sunni Muslims and Buddhists compared to Leh district where majority of population is Buddhist. So another possibility of higher prevalence of HBV infection could be due to the practice of self flagellation by Shia Muslims, during the Holy month of Muharram. In this ritual, a metallic chain with multiple knifelets is used to inflict injuries on one's body especially back of trunk and head and the chain is then many a times shared by fellow community members. So there are chances of transmission of HBV infection through blood of infected persons. Similar observations were made by Iqbal wani et al in his study in Kargil district of Ladakh where he reported a seroprevalence of 8.4% among shia Muslim compared to 4.75% in Sunni Muslims(OR=1.65;P-0.347).<sup>13</sup> Also Naqshbandi et al found HBsAg seropositivity of 2.3% among kashmiri Shia Muslims compared to 0.7% among sSunni Muslims(P-0.03)<sup>14</sup>

Our study revealed significant trend of HBV seropositivity with relation to age. The seropositivity increased with age peaking among young and middle-aged individuals. This favours horizontal transmission in early childhood as the principal mode of transmission of the virus, contrary to vertical transmission, which was popularly assumed. We could find only one HBsAg positive child in 1-10 years age group. This is comparable to results of study conducted by James et al<sup>15</sup>. Similar observations have also been made from many other studies.<sup>16,17</sup>

In our study we found higher seroprevalence of HBsAg among subjects with positive family history of HBV infection as compared to in those without such history in family(P=0.050). These observations were consistent with other studies.<sup>7,17</sup>Our study also showed a higher prevalence of HBsAg among males as compared to females. However the difference was statistically insignificant. Studies from Sudan and Iran showed that the male gender was considered risk factors for HBV infection<sup>11,18</sup>. We also found higher prevalence of HBV infection in persons with risk factors such as history of surgery, blood transfusion recipients, visit outside state, shaving at barber shop/ sharing of blades. However the difference was statistically insignificant ( $P > 0.05$ ).

In conclusion, the prevalence of HBV infection in Ladakh region is slightly more the national average of HBV

seropositivity. Besides Kargil district has higher prevalence with family contact of being an important risk factor. The need of the hour is that people should be made aware of this fatal disease and its mode of transmission and safety measures should be taken to prevent further spread of the disease. Also it is important to screen family members of HBsAg positive cases. Hepatitis is a major problem in India and will continue to be so until a nationwide vaccination programmes are made fully operational and other control measures are established.

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