Original Article

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Microbiology Section

# Prevalence of Hepatitis B Co-infection in HIV Patients and their Demographic Parameters in Patients, attending Tertiary Care ART Centre, Jhalawar, Rajasthan, India: A Retrospective Study

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## ABSTRACT

**Introduction:** The number of Human Immunodeficiency Virus (HIV)-infected patients has been progressively rising in India. The Hepatitis B Virus (HBV) shares a common route of transmission with HIV, leading to a high likelihood of co-infection. This association has been extensively studied in the Western world, revealing an increasing prevalence of HBV and HIV co-infection. While individual studies estimating the prevalence of HBV or HIV are abundant, studies specifically focusing on HBV and HIV co-infections are not as common, especially in Rajasthan, India.

**Aim:** To analyse the prevalence of HBV in HIV-infected patients in a semiurban area, and also to compare their demographic variables among patients attending a tertiary care Anti-Retroviral Treatment (ART) centre.

**Materials and Methods:** A retrospective hospital-based study was conducted in which the data of 153 patients who visited the ART centre in Jhalawar, Rajasthan, India from July 2022 to July 2023 was analysed. All HIV patients were tested for Hepatitis B surface antigen (HBsAg) using rapid detection methods and Enzyme-Linked Immunosorbent Assay (ELISA). Demographic variables such as age and sex were considered, and their impact was recorded. Statistical analysis was performed on various demographic variables and compared using the Chi-square test.

**Results:** The study revealed that HBV infection was common among HIV patients residing in Jhalawar, an eastern part of Rajasthan, India with a prevalence of 7.8%, which was comparable to other districts in Rajasthan and India. Out of the 153 patients, a total of 12 were suffering from HBV and HIV co-infection, with seven males (58.33%) being predominantly affected compared to five females (41.67%). The age group of 18-30 years had the highest number of patients, with seven individuals (58.33%), of which 4 (57.14%) were males and 3 (42.86%) were females. However, statistical significance was not achieved when comparing age and sex parameters affecting HBV and HIV co-infected patients.

**Conclusion:** All HIV patients, especially young males, need to be regularly screened for HBV co-infection, as the risk of acquiring both infections together is high due to common routes of transmission. Additionally, dual seropositivity increases mortality and morbidity. The high prevalence of HBV-HIV co-infections in this geographical area necessitates detailed study to further compare other prevailing risk factors in the community.

**Keywords:** Acquired immunodeficiency syndrome co-infection, Hepatitis B prevalence, Retroviral transmission, Seropositivity

## INTRODUCTION

The HIV is a member of the retrovirus family that leads to Acquired Immunodeficiency Syndrome (AIDS), and HBV is a double-stranded DNA virus which causes chronic hepatitis, liver fibrosis, and hepatic cancer. According to the fact sheet released by the Ministry of Health and Family Welfare, Government of India, in 2021 under the National Program for Surveillance of Viral Hepatitis, out of 145,912 samples tested for HBV, Hepatitis C (HCV), and HIV, only 6 (0.004%) patients were found to have co-infection with HIV and HBV [1]. There have also been a few studies conducted in Rajasthan to estimate the burden of HBV-HIV co-infection, but most other studies have only calculated the prevalence of HBV in different patient groups, such as those with chronic kidney disease on haemodialysis, the general population attending infectious disease clinics, or in the community. Therefore, combined prevalence data for HBV and HIV co-infection is scarce in Rajasthan and has only been reported in a few studies.

Multiple epidemiological studies conducted worldwide have revealed a complex interaction between HBV and HIV. Since there is a common route of transmission for HBV and HIV, such as sexual transmission and intravenous drug abuse, co-infection can lead to increased mortality and morbidity [2,3]. Due to low antibody production in HIV patients secondary to compromised immunity, a protective response to acute HBV infection is often lacking, resulting in a higher likelihood of chronic HBV infection compared to non HIV patients [4-6]. The risk of progression to cirrhosis, End-Stage Liver Disease (ESLD), and Hepatocellular Cancer (HCC) is higher in HBV and HIV co-infection, contributing to increased mortality [7-10]. Therefore, early screening and treatment for HBV are crucial for individuals with HIV. The global prevalence of HBV and HIV co-infection is estimated to be around 5-10% [3,11], with most studies on HIV-HBV co-infected patients being conducted in western countries [12]. Understanding HBV co-infections with HIV is particularly vital in Asian countries due to the high background prevalence of HBV [13]. Thio CL recommended routine testing for HBV infection with HBsAg, total hepatitis B core antibody (anti-HBc), and hepatitis B surface antibody (anti-HBs) in all HIV-positive individuals [14]. Therefore, authors conducted this study to estimate the prevalence of HBV in HIV-positive patients and to determine if there is any significant association with age and sex in acquiring these infections through statistical analysis. By studying these aspects, authors aimed to gain valuable insights into the increasing cases of such co-infections in our region. Early detection of these cases is crucial for better patient management in facing this dual challenge.

## MATERIALS AND METHODS

This was a retrospective hospital-based, time-bound study aimed at estimating the prevalence of HBV co-infection in HIV patients among the Indian population at a tertiary care centre. The study was conducted at the Department of Microbiology, Jhalawar Medical College, Jhalawar, Rajasthan, over a one-year period from 1st July 2022 to 1st July 2023. After obtaining approval from the Institutional Human Ethics Committee (S. No. 16/219 Dated-11/10/2023), the review and analysis were carried out in November 2023.

**Inclusion criteria:** All HIV-positive patients who visited our ART centre during this one-year period were included in the study.

**Exclusion criteria:** Those who either transferred to another centre or did not come for follow-up were excluded from the study.

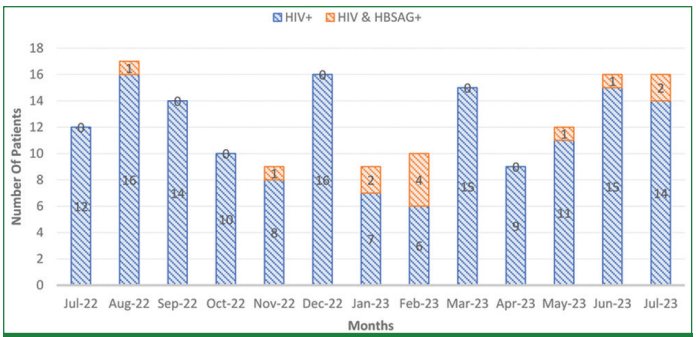
Out of a total of 168 patients, 15 patients were excluded due to reasons such as death, transfer to another institute, or loss to follow-up during the study period. Following confirmation of HIV status according to the National AIDS Control Organisation (NACO) guidelines [15] and the institutional protocol, enrolled patients were tested for HBsAg using the SD Bioline rapid immunochromatographic assay, which boasts both 100% sensitivity and specificity. Samples that tested reactive for HBsAg by the immunochromatographic test were further confirmed using a commercial ELISA kit (HEPALISA with sensitivity and specificity of 100% [16]) with fresh samples. Additionally, baseline tests such as liver function, kidney function, complete blood counts, and CD4 levels were conducted in accordance with NACO guidelines [15], and sample processing was carried out following manufacturer protocols in the Department of Microbiology. Patient data including age, sex, residence, phone number, family details, occupation, and other relevant information were recorded upon their initial enrolment at our ART centre in a hospital register and the patient's ART diary. The demographic parameters such as age within different subgroups (<18 years, 19-30 years, 31-60 years, and >60 years), sex of the patients, and the monthly detection numbers were then categorised based on the obtained data.

## STATISTICAL ANALYSIS

For statistical analysis, various percentages and proportions of categorical variables were calculated. To determine the association between variables such as seropositive HIV, HBV co-infection, and HIV alone, with due consideration given to gender, the Chi-square test was utilised. A p-value <0.05 was considered significant.

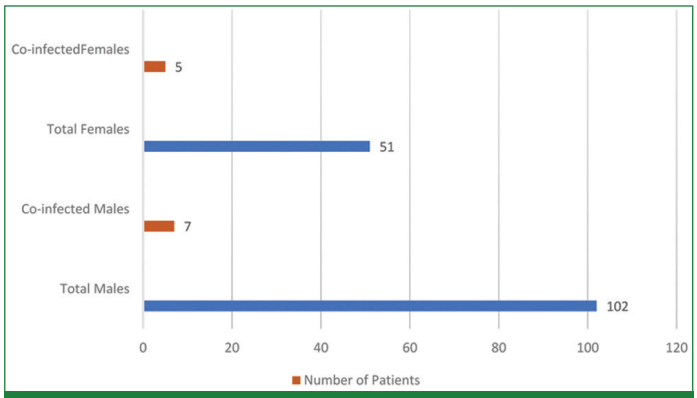
## RESULTS

Out of the 153 patients, 12 were found to have dual infection, resulting in an estimated prevalence of 7.8% for HBV co-infection in HIV patients. The month-wise distribution of patients is presented in [Table/Fig-1], indicating the highest case detections of HBV/HIV co-infection during the winter months of January and February 2023.




**[Table/Fig-1]:** Month wise distribution of HBV/HIV co-infected and total HIV patients.

The present study also revealed a male predominance, with a total of 7 males (58.33%) among the co-infected cases, while females accounted for 5 (41.67%) of all HBV and HIV co-infected patients out of the total of 153 HIV-positive patients, 102 were males (66.67%) and 51 were females (33.33%), as illustrated in [Table/Fig-2]. There was a non significant relationship, indicating no gender predilection among these co-infections [Table/Fig-3].




**[Table/Fig-2]:** Gender wise distribution of HBV/HIV co-infected patients.

| Sex | HBV-HIV co-infected | HIV positive patients | Chi-square test value/p-value |
|---|---|---|---|
| Males | 7 | 102 | 0.3447/0.55 |
| Females | 5 | 51 | |

**[Table/Fig-3]:** Sex wise distribution of study participants and their p-value.
A p-value of <0.05 was considered significant

| Age group (years) | Positive males | Positive females | Chi-square test value/p-value |
|---|---|---|---|
| <18 | 1 | 0 | 0.4762/0.49 |
| 19-30 | 4 | 3 | |
| 31-60 | 1 | 2 | |
| >60 | 1 | 0 | |

**[Table/Fig-4]:** Age wise distribution of study participants and their p-value.
A p-value of <0.05 was considered significant

The highest number of HBV and HIV co-infections occurred within the 18-30 years age group, with a total of seven patients (58.33%), out of which four were males (57.14%) and three were females (42.85%). Following this, the 31-60 years age group had a total of three patients (25%) who were co-infected, with females (n=2, 66.66%) being affected twice as often as males (n=1, 33.33%). There was one patient each in the age groups <18 years and >60 years, both of whom were males. Furthermore, the statistical analysis of patient distribution by gender within the age-wise categories of 18-30 years and 31-60 years using the Chi-square test showed non significant results, as presented in [Table/Fig-4]. No comparison could be made in other age groups as there were no females infected with HBV in the <18 years and >60 years age groups.

## DISCUSSION

The prevalence of HBV co-infection in HIV patients was calculated to be 7.8% in present study, indicating that individuals at high risk of acquiring HIV are also at high risk of acquiring HBV infection. HBV can cause a diverse clinical spectrum in patients, such as acute self-resolving hepatitis, asymptomatic chronic carrier status, or severe conditions like fulminant hepatitis, liver cirrhosis, and HCC. This infection is a significant public health concern worldwide, with 400 million individuals chronically infected and approximately one million deaths annually due to HBV-related diseases [17]. In India, with its vast geographical area, the prevalence of HBV in the general population varies from 0.1% to 11.7% [18]. This infection shares common transmission routes with HIV, leading to a high burden of co-infection in the community. For instance, one study from India has shown the prevalence of HBsAg in HIV seropositive patients to be up to 30% [19].

To estimate the burden of HIV alone in the community, the National AIDS Control Program (NACP), under NACO, calculated that in

2020, a total of 23.19 lakh (18.33-29.78 lakh) people were living with HIV, of which patients in the age group of 15-49 years had a prevalence of HIV at 0.22% (0.17%-0.29%). The prevalence has decreased from 0.54% in 2000-01 to 0.33% in 2010 to 0.22% in 2020. The states of Mizoram, Nagaland, and Manipur in the east had higher prevalence compared to the national average of HIV prevalence, while in North India, regions like Delhi and Punjab were found to have a higher prevalence of HIV than the national average [20]. Although HIV prevalence is low in Rajasthan, according to NACP, there are 10 districts classified as high priority out of a total of 33 districts [20]. According to district-level reports by NACO, Jhalawar falls under the category of very low priority with an HIV prevalence of <0.10% [21].

Due to the increased burden of these infections in the community, there could be a large number of HIV patients who might be co-infected with other viruses like HBV or HCV due to their similar modes of transmission. Therefore, screening for HBV should be conducted in all HIV-positive patients. Various similar studies have been conducted in other parts of India. For example, a study from Hyderabad, South India reported a prevalence of 15%, while another study from Chennai calculated a prevalence of 9% for HBV-HIV co-infections [22-24]. Males have outnumbered females in these studies [22-24], similar to present study results, which may be due to increased exposure to various risk factors such as injection drug use and sexual promiscuity.

When searching for data regarding HIV-HBV co-infections in Rajasthan, it was found that data from hospital-based studies were very limited, prompting further investigation into this subject. In Rajasthan, a study was conducted at a tertiary care centre in Jaipur by Mathur A et al., where they found the prevalence of HBV and HIV co-infection to be zero, which was surprising given that studies from other parts of India have reported high prevalence rates. For instance, a study conducted by Sarkar J et al., at a tertiary care hospital in West Bengal reported a 8.3% seropositivity for these co-infections [25,26]. Another study conducted in Kota, Rajasthan by Meena V et al., estimated the prevalence of HBV-HIV co-infections to be 35%, with 37.1% of them being males in the age group of 21-30 years [27]. In the present study, the prevalence was not as high as the aforementioned studies, but it mainly affected males in the age group of 18-30 years. Another study by Hooda S et al., conducted in Jaipur estimated the prevalence of HBV-HIV co-infections to be 10.5% [28].

The treatment of HIV/HBV has made significant advancements, but new challenges have emerged over time. Various studies are showing that mortality related to liver diseases and its complications among HIV patients is on the rise [29]. One emerging challenge is the development of drug resistance, hepatotoxicity, and unresponsiveness to first-line treatments, as well as the reactivation of HBV replication after the withdrawal of dually active antiviral drugs, leading to the emergence of resistant strains [29]. Therefore, early diagnosis and appropriate management of HBV infection in HIV co-infected individuals are of critical importance. The treatment of HIV with ART has increased the survival rates among HIV patients, giving HBV co-infected individuals more time to progress to chronic hepatitis, cirrhosis, or malignancy in the future. Hence, guidelines should be formulated to address this challenge.

### Limitation(s)

The inability to measure HBV DNA levels for occult infections, the inability to perform liver biopsies in borderline cases, and the lack of a control group. However, the study did address some important demographic variables related to this dual infection.

## CONCLUSION(S)

Due to the high prevalence of HBV-HIV co-infection at our centre and in adjacent districts like Jaipur and Kota, it is imperative that more studies be conducted in other districts of Rajasthan to accurately estimate the true burden of this dual infection in the community. Additional data should also be collected regarding the risk factors that may have contributed to the increased prevalence of HBV-HIV co-infected patients among the young age group between 18-30 years. Based on the study data, authors recommend conducting regular screening for HBV infections in all HIV-positive patients so that early detection can prompt the initiation of HBV treatment.

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