Section: Microbiology

Original Research Article

ANTIRETROVIRAL THERAPY OUTCOMES AMONG HIV PATIENTS WITH HBV AND HCV CO-INFECTION: A CROSS-SECTIONAL STUDY

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Received *: 23/04/2026*
Received in revised form *: 11/06/2026*
Accepted *: 26/06/2026*

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DOI: 10.70034/ijmedph.2026.3.122

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (3); 753-757

ABSTRACT

Background: Co-infection with hepatitis B virus (HBV) and hepatitis C virus (HCV) is common among people living with HIV (PLHIV) and may influence antiretroviral therapy (ART) outcomes. The World Health Organization (WHO) recommends the use of HBV-active ART regimens and routine screening for viral hepatitis co-infections, while UNAIDS emphasizes achieving the 95-95-95 targets for HIV control.

Materials and Methods: A retrospective cross-sectional record review was conducted among patients attending a tertiary HIV care clinic between 2019 and 2024. A total of 56 patient records were screened, of which 55 HIV-positive individuals with documented HBV and/or HCV co-infection were included in the analysis. Data on demographic characteristics, CD4 cell counts, ART regimens, HBV/HCV serostatus, and HIV viral load (VL) were extracted. Viral load was measured using the Abbott m2000sp/m2000rt platform. Viral suppression was defined as either "target not detected" or VL <150 copies/mL. CD4 count data were available for 52 patients and viral load data for 51 patients.

Results: The mean age of participants was 44.7 years (SD: 14.1), and 72.7% were male. HBV co-infection was observed in 81.8% of patients, HCV in 16.4%, and dual HBV/HCV co-infection in 1.8%. Mean CD4 counts were similar between HBV-only (341.5 cells/µL) and HCV-only (342.7 cells/µL) groups, while the single dual-infected patient had a CD4 count of 145 cells/µL. Overall, viral suppression was achieved in 85.5% of patients. The majority (89.1%) were receiving first-line ART regimens.

Conclusion: In this cohort of HIV patients with HBV and/or HCV co-infection, high rates of viral suppression were observed despite a substantial burden of hepatitis co-infection. These findings highlight the effectiveness of HBV-active first-line ART regimens and support the integration of HIV and viral hepatitis services to optimize treatment outcomes.

Keywords: HBV, HIV, PLHIV, HCV.

INTRODUCTION

Human immunodeficiency virus (HIV) infection remains a major global public health concern despite significant advances in diagnosis, prevention, and antiretroviral therapy (ART). The widespread scale-up of ART has substantially reduced HIV-associated morbidity and mortality, transforming HIV into a chronic manageable condition. However, long-term treatment success is influenced by several host- and virus-related factors, among which co-infection with hepatotropic viruses—particularly hepatitis B virus (HBV) and hepatitis C virus (HCV)—is of major clinical importance.

HBV and HCV share common transmission routes with HIV, including exposure to infected blood and body fluids, unsafe injections, and high-risk sexual practices. Consequently, co-infection is frequently observed, especially in regions with high endemicity and among populations with increased exposure risk. Globally, HBV co-infection among people living with HIV (PLHIV) is estimated at 5–20%, while

HCV co-infection ranges from 2–15%, depending on geographic distribution and risk profiles.[1,2] In India, reported prevalence rates among PLHIV range from 3–10% for HBV and 1–5% for HCV, highlighting a significant public health burden.[3]

The coexistence of HIV with HBV or HCV leads to complex viral interactions that can accelerate disease progression and worsen clinical outcomes. HIV-associated immunosuppression enhances HBV and HCV replication, contributing to more rapid progression of liver disease. As a result, co-infected individuals are at increased risk of hepatic fibrosis, cirrhosis, and hepatocellular carcinoma compared to those with HIV mono-infection.[4,5] In the ART era, liver-related complications have emerged as a leading cause of non-AIDS-related mortality among PLHIV.[6]

In addition to hepatic complications, HBV and HCV co-infection may adversely affect immunological and virological responses to ART. Several studies have reported delayed CD4+ T-cell recovery and suboptimal immune reconstitution in co-infected patients, which may compromise long-term treatment outcomes.[7] Furthermore, co-infected individuals are more susceptible to antiretroviral-associated hepatotoxicity, which can lead to treatment modifications, interruptions, and reduced adherence.[8]

Although tenofovir-based ART regimens combined with lamivudine or emtricitabine provide dual activity against HIV and HBV, complete suppression of HBV replication is not always achieved, and progressive liver disease may still occur.[9] In the case of HCV, the introduction of direct-acting antivirals (DAAs) has revolutionized treatment outcomes; however, access remains limited in many resource-constrained settings, and integration with ART poses additional clinical challenges.

Another important consideration is immune reconstitution inflammatory syndrome (IRIS), which may occur following ART initiation and can result in hepatic flares in patients with underlying HBV or HCV infection. This underscores the need for careful monitoring of liver function during early treatment phases.[10]

Despite the availability of effective screening and therapeutic options, HBV and HCV co-infections remain underdiagnosed and undertreated in many HIV-infected populations, particularly in low- and middle-income countries. This gap highlights the need for integrated HIV and viral hepatitis care approaches.

Therefore, this study aims to evaluate the impact of HIV–HBV and HIV–HCV co-infection on immunological and virological outcomes among people living with HIV receiving ART in a tertiary care setting.

MATERIALS AND METHODS

Study Design: This retrospective cross-sectional study was conducted to assess the impact of hepatitis B virus (HBV) and hepatitis C virus (HCV) co-infection on antiretroviral therapy (ART) outcomes among people living with HIV (PLHIV).

Study Setting: The study was carried out in the Department of Microbiology of a tertiary care teaching hospital in Central India. Relevant laboratory records and patient case files were reviewed for the study period.

Study Population: A total of 55 HIV-positive patients with documented HBV and/or HCV co-infection were included in the study. Patients with incomplete demographic or laboratory records were excluded from analysis. CD4 count and viral load analyses were performed only for patients with available data. Inclusion was limited to individuals who underwent testing for HIV, HBV, and HCV and had complete clinical and laboratory records available.

Sample Collection and Handling: Blood samples from admitted patients were collected aseptically by trained healthcare personnel and transported to the Department of Microbiology under standard transport conditions. All samples received in the laboratory were properly registered and processed according to institutional protocols.

Laboratory Methods: All blood samples were tested for HIV, HBV, and HCV using standard serological methods. HIV infection was diagnosed according to National AIDS Control Organization (NACO) guidelines using approved testing strategies. HBV infection was identified by detection of hepatitis B surface antigen (HBsAg), while HCV infection was determined by detection of anti-HCV antibodies using validated serological assays.

Data Collection: Demographic details, clinical characteristics, ART regimen information, CD4+ T-cell counts, and laboratory results were extracted from patient records and laboratory databases. Based on serological status, patients were categorized as HIV mono-infected or HIV–HBV/HCV co-infected.

Outcome Measures: The primary objective was to evaluate the impact of HBV and HCV co-infection on ART outcomes. Immunological and virological parameters, including CD4+ T-cell counts and viral load suppression, were compared between mono-infected and co-infected groups.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using appropriate statistical software. Descriptive statistical methods were applied. Continuous variables were summarized as mean ± standard deviation or median with interquartile range, as appropriate, while categorical variables were expressed as frequencies and percentages.

RESULTS

A total of 56 medical records were reviewed during the study period (2019–2024). One record was excluded as the patient was HIV-negative; therefore, 55 HIV-positive patients were included in the final analysis.

The mean age of the study participants was 44.7 ± 14.1 years. The majority of patients belonged to the 30–49 years age group (47.3%), followed by those aged ≥50 years (30.9%), and 18–29 years (21.8%). Males constituted the majority of the study population (72.7%), while females accounted for 27.3%.

With respect to the year-wise distribution of records, most cases were documented in 2023 (49.1%), followed by 2024 (30.9%), 2019 (9.1%), 2022 (7.3%), and 2021 (3.6%). No eligible records were available for 2020. This trend reflects increased patient follow-up and improved documentation in recent years. [Table 1]

Table 1: Socio demographic characteristics of study participants (n = 55)

Variable	Category	n (%)
Age group	18-29 years	12 (21.8)
	30-49 years	26 (47.3)
	≥ 50 years	17 (30.9)
Gender	Male	40 (72.7)
	Female	15 (27.3)
Year of record	2019	5 (9.1)
	2020	0
	2021	2 (3.6)
	2022	4 (7.3)
	2023	27 (49.1)
	2024	17 (30.9)

Data are presented as number (n) and percentage (%). Percentages may not sum to 100 due to rounding. HBV: hepatitis B virus; HCV: hepatitis C virus; HIV: human immunodeficiency virus. Year-wise distribution reflects available and eligible patient records included in the study period (2019–2024).

Among the 55 HIV-positive patients included in the analysis, HBV co-infection was the most common, observed in 45 patients (81.8%). HCV co-infection was identified in 9 patients (16.4%), while dual HBV and HCV co-infection was present in 1 patient (1.8%). The findings indicate a predominant burden of HBV co-infection in this cohort of people living with HIV receiving ART. [Table 2]

Table 2: Prevalence of HBV and HCV co-infection among study participants (n = 55)

Infection status	Number (%)
HIV + HBV only	45 (81.8)
HIV + HCV only	9 (16.4)
HIV + HBV + HCV	1 (1.8)
Total	55 (100)

Data are presented as number (n) and percentage (%). Percentages may not sum to 100 due to rounding. HBV: hepatitis B virus; HCV: hepatitis C virus; HIV: human immunodeficiency virus. Co-infection status was determined based on serological detection of HBsAg for HBV and anti-HCV antibodies for HCV.

Mean CD4 counts were similar in HBV-only (341.5 cells/µL) and HCV-only (342.7 cells/µL) groups, indicating no significant difference in immunological status between these co-infection categories. The single patient with dual HBV/HCV co-infection had a lower CD4 count (145 cells/µL); however, this finding is not generalizable due to the very small sample size. Overall, CD4 variability was high within groups, reflecting heterogeneous immune status among participants. [Table 3]

Table 3: CD4 cell counts according to co-infection status (n = 52)

Group	Number	Mean CD4 count	Median	SD
HBV only	42	341.5	308.5	256.0
HCV only	9	342.7	291.0	251.6
HBV + HCV	1	145.0	145.0	-

Data are presented as number (n), mean, median, and standard deviation (SD). CD4 counts are expressed as cells/µL. HBV: hepatitis B virus; HCV: hepatitis C virus; HIV: human immunodeficiency virus. SD is not applicable for the HBV + HCV group due to a single observation. CD4 count analysis was performed only for patients with available records (n = 52).

The majority of patients (89.1%) were receiving first-line ART, while 10.9% were on second-line therapy. Among HBV co-infected patients, 92.9% were on first-line ART and 7.1% were on second-line ART. All HCV-only and dual HBV/HCV co-infected patients were receiving first-line ART. CD4 count data were unavailable for three patients. [Table 4]

Table 4: Distribution of ART regimens among study participants (n = 55)

Group	First line ART n(%)	Second line ART n (%)	Total
HBV only	39 (92.9)	3 (7.1)	42

HCV only	9 (100)	0	9
HBV +HCV	1 (100)	0	1
Total	49 (89.1)	6 (10.9)	55

Data are presented as number (n) and percentage (%). HBV: hepatitis B virus; HCV: hepatitis C virus; HIV: human immunodeficiency virus; ART: antiretroviral therapy. Percentages are based on available treatment records (n = 55).

Viral load data were available for 51 patients. Overall, 43 patients (85.5%) achieved viral suppression. Viral suppression was observed in 85.4% of HBV-only co-infected patients and 88.9% of HCV-only patients. The single patient with dual HBV/HCV co-infection had a detectable viral load (145 copies/mL) and therefore did not meet the criteria for viral suppression. Viral load results were unavailable for four patients. [Table 5]

Table 5: Viral suppression according to co-infection status (n = 51)

Group	*n* with VL data	Suppressed *n* (%)
HBV only	41	35 (85.4)
HCV only	9	8 (88.9)
HBV + HCV	1	0
Total	51	43 (85.5)

Data are presented as number (n) and percentage (%). Viral suppression was defined as HIV RNA <150 copies/mL or "target not detected." HBV: hepatitis B virus; HCV: hepatitis C virus; HIV: human immunodeficiency virus; VL: viral load. Viral load data were unavailable for four patients due to missing records.

DISCUSSION

The present study evaluated the impact of hepatitis B virus (HBV) and hepatitis C virus (HCV) co-infection on antiretroviral therapy (ART) outcomes among people living with HIV attending a tertiary care centre in Nagpur. The findings demonstrated a high burden of viral hepatitis co-infection, particularly HBV, among HIV-positive patients. Despite this, ART outcomes were favourable, with 85.5% of patients achieving viral suppression.

The mean age of participants was 44.7 years, with a clear male predominance (72.7%). Similar demographic patterns have been reported in previous studies, where middle-aged males constitute the majority of HIV-infected individuals, likely due to increased occupational mobility and higher exposure to risk behaviours.[2,6] In the present study, HBV co-infection was substantially more common than HCV co-infection. This finding is consistent with overlapping transmission routes between HIV and HBV, particularly sexual transmission and exposure to infected blood products.[4] The higher prevalence observed may also reflect referral bias inherent to tertiary care hospital-based studies, where more complex cases are often managed.[7,11]

The immunological profile showed comparable mean CD4 counts among HBV-only and HCV-only co-infected patients, suggesting that hepatitis co-infection may not significantly alter baseline immune status in patients receiving ART. This is consistent with findings by Kouamé et al., who reported no significant differences in treatment outcomes between mono-infected and co-infected individuals on optimized ART.[12] However, interpretation of the dual HBV/HCV co-infection group is limited due to the presence of only one patient, although this individual demonstrated lower CD4 count and detectable viral load.

Evidence regarding immune recovery in co-infected patients remains mixed. Some studies have reported delayed CD4 recovery and increased liver-related complications in HIV-HBV co-infection,[13] while others have demonstrated impaired immune restoration in HIV-HCV co-infection due to persistent immune activation and chronic inflammation.[14] Even after HCV clearance with direct-acting antivirals, residual immune dysregulation may persist, potentially contributing to long-term hepatic and systemic complications.[15]

Most patients in this study were receiving first-line ART regimens, predominantly tenofovir-based combinations, in accordance with current WHO and national guidelines. Tenofovir-containing regimens provide dual activity against HIV and HBV and are associated with improved virological outcomes in co-infected individuals.[16] The high viral suppression rate observed in this study supports the effectiveness of HBV-active ART regimens in routine clinical practice.

Overall viral suppression was achieved in 85.5% of patients, indicating satisfactory virological control, although slightly below the UNAIDS 95% target among treated individuals. Comparable suppression rates between HBV-only and HCV-only groups suggest that hepatitis co-infection may not significantly compromise ART effectiveness when appropriate regimens and adherence are ensured. Similar findings have been reported in studies from Mozambique and Côte d'Ivoire.[12,17]

The single patient with dual HBV/HCV co-infection had detectable viral load, suggesting potential challenges in achieving optimal virological control in such cases. Although no firm conclusions can be drawn, previous studies have indicated that dual hepatitis infection may increase the risk of hepatic injury and treatment complexity.[5,13]

These findings highlight the importance of integrated HIV–hepatitis care, including routine screening for HBV and HCV, early initiation of HBV-active ART,

regular viral load monitoring, and improved access to direct-acting antivirals for HCV, particularly in resource-limited settings.[15,16]

The study has certain limitations. The small sample size and absence of an HIV mono-infected control group limited comparative analysis. Additionally, HBV DNA and HCV RNA testing were not available, restricting assessment of viral replication and disease activity. Despite these limitations, the study provides useful real-world evidence on HIV–hepatitis co-infection and ART outcomes in a tertiary care setting.

CONCLUSION

The present study highlights a substantial burden of HBV and HCV co-infection among people living with HIV, with HBV being more prevalent than HCV. Despite this, the majority of patients achieved favourable ART outcomes, with over 85% attaining viral suppression and maintaining stable immunological status.

The findings suggest that tenofovir-based first-line ART regimens play a key role in achieving effective virological control in co-infected individuals. Similar CD4 counts and viral suppression rates between HBV- and HCV-co-infected patients further support the effectiveness of integrated HIV–hepatitis management strategies.

However, patients with dual HBV/HCV co-infection may be at higher risk of suboptimal outcomes, warranting closer clinical monitoring and individualized management. Routine screening for HBV and HCV among all HIV-positive individuals, timely initiation of HBV-active ART, regular viral load monitoring, and improved access to HCV treatment are essential to reduce liver-related morbidity and mortality.

Further large-scale longitudinal studies incorporating HBV DNA and HCV RNA testing are recommended to better understand the long-term impact of viral hepatitis co-infection on ART response and disease progression among people living with HIV.

REFERENCES

1. World Health Organization. Global progress report on HIV, viral hepatitis and sexually transmitted infections. Geneva: WHO; 2024.
2. Platt L, Easterbrook P, Gower E, McDonald B, Sabin K, McGowan C, et al. Prevalence and burden of HCV co-infection in people living with HIV: a global systematic review and meta-analysis. Lancet Infect Dis. 2016;16(7):797–808.
3. Saravanan S, Velu V, Kumarasamy N, et al. Coinfection of hepatitis B and hepatitis C virus in HIV-infected patients in south India. World J Gastroenterol. 2007;13(37):5015–20.
4. Thio CL. Hepatitis B and human immunodeficiency virus coinfection. Hepatology. 2009;49(S5):S138–45.
5. Benhamou Y. Hepatitis C virus and HIV coinfection: impact on disease progression and treatment. Clin Infect Dis. 2002;35(Suppl 1):S47–S54.
6. Smith CJ, Ryom L, Weber R, Morlat P, Pradier C, Reiss P, et al. Trends in underlying causes of death in people with HIV. Lancet. 2014;384(9939):241–8.
7. Hoffmann CJ, Thio CL. Clinical implications of HIV and hepatitis B co-infection in Asia and Africa. Lancet Infect Dis. 2007;7(6):402–9.
8. Sulkowski MS. Drug-induced liver injury associated with antiretroviral therapy. Clin Infect Dis. 2004;38(Suppl 2):S90–7.
9. Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the use of antiretroviral agents in adults and adolescents with HIV. NIH; 2024.
10. Murdoch DM, Venter WD, Feldman C, Van Rie A. Immune reconstitution inflammatory syndrome (IRIS): review of common infectious manifestations. AIDS. 2007;21(4):443–50.
11. Seyoum E, Demissie M, Worku A, Mihret A, Abdissa A, Berhane Y. Retention on antiretroviral therapy in persons with HIV and viral hepatitis coinfection in Ethiopia: a retrospective cohort study. BMC Public Health. 2022;22:644.
12. Kouamé GM, et al. Effect of HBV/HCV coinfection on antiretroviral therapy outcomes among people living with HIV. PLoS One. 2022;17:e0264956.
13. Hawkins C, Christian B, Ye J, Nagu T, Aris E, et al. Prevalence of hepatitis B co-infection and response to antiretroviral therapy among HIV-infected patients in Tanzania. AIDS. 2013;27(6):919-27.
14. TREAT Asia HIV Observational Database. Impact of hepatitis C virus coinfection on HIV outcomes in Asia. PLoS One. 2016;11(3):e0150510.
15. Sachithanandham J, Leep-Lazar J, Quinn J, Bowden K, Balasubramaniam P, Ward K, et al. Direct-acting antivirals quickly eradicate hepatitis C virus from the liver in people with human immunodeficiency virus but do not fully reverse immune activation. J Infect Dis. 2025;231(5):1299-1308.
16. Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the use of antiretroviral agents in adults and adolescents with HIV: HBV/HIV coinfection. Bethesda: National Institutes of Health; 2024.
17. Chambal LM, Nilsson C, Augusto O, Tchavana C, Sevene E, et al. Retention in care and viral suppression in people living with HIV and chronic hepatitis B in Maputo City, Mozambique: a prospective cohort study. Sci Rep. 2026;16:11840.