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Seroprevalence of Hepatitis B and C among HIV-Positive Adults on Antiretroviral Therapy in a Rural District of Western Tanzania

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Abstract Hepatitis B virus (HBV) and hepatitis C virus (HCV) co-infections are important causes of morbidity and mortality among people living with HIV (PLHIV), particularly in sub-Saharan Africa. Although several studies have documented the burden of HIV–hepatitis co-infection in urban and peri-urban settings in Tanzania, data from rural western regions remain limited. This study aimed to determine the seroprevalence of HBV and HCV among HIV-positive adults receiving antiretroviral therapy (ART) in Kakonko District, western Tanzania. A facility-based cross-sectional study was conducted among HIV-positive adults aged ≥ 18 years attending three Care and Treatment Clinics in Kakonko District. Participants were selected using simple random sampling. Sociodemographic and clinical data were collected using a structured questionnaire. Finger-prick blood samples were tested for hepatitis B surface antigen (HBsAg) and anti-HCV antibodies using rapid immunochromatographic assays. Data were analyzed using Stata version 16, and seroprevalence was calculated with 95% confidence intervals. A total of 283 HIV-positive adults on ART were included in the analysis. Females accounted for 66% of participants, and 63% were aged below 45 years. More than half of the participants had been on ART for over five years, and 98% were receiving a tenofovir – lamivudine–dolutegravir (TLD)-based regimen. None of the participants tested positive for HBsAg or anti-HCV antibodies. No cases of dual HBV/HCV infection were identified, yielding a seroprevalence of 0% for HBV, HCV, and HBV/HCV co-infection. No evidence of HBV or HCV co-infection was found among HIV-positive adults receiving ART in Kakonko District. Long-term ART use and effective HIV prevention and care interventions may have contributed to these findings. Continued routine hepatitis screening and integration of viral hepatitis services within HIV care programs are recommended to sustain low co-infection rates.

Keywords: *HIV, Hepatitis B, Hepatitis C, Co-infection, Antiretroviral therapy, Rural Tanzania*

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1. Introduction

Human immunodeficiency virus (HIV) infection remains a major global public health challenge, with a disproportionate burden borne by sub-Saharan Africa [1,2]. Co-infection with chronic viral hepatitis, particularly hepatitis B virus (HBV) and hepatitis C virus (HCV), significantly exacerbates morbidity and mortality among people living with HIV (PLHIV). These co-infections accelerate progression to liver cirrhosis, hepatocellular carcinoma, and liver-related mortality, even in the era of antiretroviral therapy (ART) [3,4]. Globally, an estimated 2.6 million PLHIV are co-infected with HBV and approximately 2.9 million with HCV [5].

The prevalence of HIV–hepatitis co-infection varies widely across geographic regions and populations. In southern India, HIV–HBV and HIV–HCV co-infection prevalences of 15% and 8.3%, respectively, have been reported, substantially higher than those observed among HIV-negative populations [1]. A meta-analysis from sub-Saharan Africa estimated a mean prevalence of 15% for hepatitis B surface antigen (HBsAg) and 7% for anti-HCV antibodies among HIV-infected individuals [6]. Studies from Ethiopia and Kenya have documented HIV–HBV co-infection rates ranging from 5% to 6% and HIV–HCV co-infection rates between 1% and 4% [7,8]. Among HIV-infected adults on ART in South Africa, HBV prevalence was 4.2% and HCV 0.1%, with HBV linked to lower CD4 counts [9].

In Tanzania, available evidence demonstrates considerable regional variation. Earlier studies from Dar es Salaam reported HIV–HBV and HIV–HCV co-infection prevalence of up to 17–18% among ART-naïve individuals, with lower prevalence observed among patients receiving ART [10,11]. Studies conducted in northern Tanzania and Mwanza have similarly shown heterogeneous prevalence of HBV and HCV markers among PLHIV [12,13].

Despite this growing body of evidence, data on viral hepatitis co-infection among people living with HIV in rural western Tanzania remain limited. No published data exist for Kakonko District, which hinders planning for targeted screening, prevention, and integrated HIV-hepatitis care. This study, therefore, aimed to determine the seroprevalence of HBV and HCV among HIV-positive adults receiving antiretroviral therapy at Care and Treatment Clinics in Kakonko District, western Tanzania.

2. Materials and Methods

2.1. Study Design and Setting

A facility-based cross-sectional study was conducted in Kakonko District, Kigoma Region, in western Tanzania. The study was carried out at three purposively selected Care and Treatment Clinics (CTCs): Kakonko Health Center, Gwanumpu Health Center, and Nyanzige Health Center. These facilities are the largest antiretroviral therapy (ART)–providing centers in the district and serve populations from the eastern, southern, and western zones of Kakonko District.

The combined number of registered HIV patients across the three clinics is approximately 1,200. The clinics provide HIV care and treatment in accordance with national guidelines, including HIV testing and counseling, initiation and monitoring of ART, routine clinical and laboratory follow-up, and management of HIV-related comorbidities and opportunistic infections [14].

2.2. Study Population

The study population comprised HIV-positive adults aged 18 years and above who were receiving ART at the selected CTCs and attended regular follow-up visits between August and November 2025.

2.3. Inclusion and Exclusion Criteria

Participants were eligible if they were HIV-positive adults (≥ 18 years), currently on ART, and willing to provide written informed consent. Individuals who had not yet initiated ART, those who reported prior hepatitis B vaccination, and those who declined participation were excluded.

2.4. Sample Size and Sampling Procedure

The sample size was initially estimated using a single-population proportion formula, assuming a 50% prevalence, a 95% confidence level, and a 5% margin of error, yielding a minimum sample size of 384 participants. The 50% prevalence was used as a conservative estimate due to the absence of district-level data on hepatitis co-infection among people living with HIV in western Tanzania. However, due to logistical constraints and the size of the eligible clinic population during the study period, 283 participants were enrolled. The study therefore used a feasibility sample with descriptive aims, which was considered adequate to provide preliminary evidence on the seroprevalence of HBV and HCV among HIV-positive adults receiving ART in the district.

A simple random sampling technique was employed. As HIV-positive patients attended the clinics for routine care, eligible individuals were randomly selected and invited to participate. Participants who provided written informed consent were enrolled in the study.

2.5. Data Collection and Counselling Procedures

Sociodemographic and clinical data were collected using a structured questionnaire administered by trained research staff. Finger-prick blood samples were obtained by qualified laboratory personnel and tested on-site for HBsAg and anti-HCV antibodies using rapid immunochromatographic test kits. Reported performance shows that HBsAg rapid tests have a sensitivity of 91.43% and a specificity of 98.28%, whereas anti-HCV rapid tests have a sensitivity of 98% and a specificity of 100%. [15,16]. Preventive health education and counseling were provided to each participant both before and after receipt of laboratory results.

2.7. Data Management and Analysis

Data were entered and analysed using Stata version 16. Categorical variables were summarized using frequencies and percentages, while continuous variables were summarized using means or medians as appropriate. The seroprevalence of HBV, HCV, and dual HBV/HCV infection was calculated with corresponding 95% confidence intervals. Due to the absence of positive cases, inferential statistical tests and multivariable analyses were not performed.

2.8. Ethical Considerations

Ethical approval was granted by the National Health Research Ethics Committee of Tanzania (Certificate No. NIMR/HQ/R.8a/Vol.IX/4986).

3. Results

3.1. Participant Characteristics

A total of 283 HIV-positive adults receiving ART were included in the final analysis. Females constituted 66% of the study population, and 63% of participants were aged below 45 years. Alcohol consumption was reported by 43% of participants, while 13% reported cigarette smoking. More than half of the participants had been on ART for over five years, and the vast majority (98%) were receiving a tenofovir–lamivudine–dolutegravir (TLD)-based regimen. Approximately 47% of participants had a recent CD4 count of ≥ 500 cells/mm^3 (Table 1).

None of the participants tested positive for HBsAg or anti-HCV antibodies. No cases of dual HBV/HCV infection were identified. Consequently, the seroprevalence of HBV, HCV, and HBV/HCV co-infection among HIV-positive adults on ART in Kakonko District was 0% (Table 2).

Table 1. Baseline socio-demographic and clinical characteristics (N=283)

Characteristic	n	%
Sex		
Female	187	66.1
Male	96	33.9
Age group (years)		
<30	62	21.9
30–39	88	31.1
40–49	62	21.9
≥50	71	25.1
Duration on antiretroviral therapy		
<5 years	132	46.6
≥5 years	151	53.4
Alcohol consumption		
No	160	56.5
Yes	123	43.5
Cigarette smoking		
No	247	87.3
Yes	36	12.7
History of blood transfusion		
No	267	94.4
Yes	8	2.8
Cannot remember	8	2.8
Current ART regimen		
TLD	278	98.2
Other regimens	5	1.8
Recent CD4 cell count (cells/μL)		
<200	7	2.5
200–500	144	50.9
>500	132	46.6

ART = antiretroviral therapy; TLD = tenofovir/lamivudine/dolutegravir

Table 2. Prevalence of HBV, HCV, and HBV/HCV Co-infection

Infection Status	Frequency (n)	Prevalence (%)	95% (CI)
HBV positive	0	0.0	0.0 – 0.0
HCV positive	0	0.0	0.0 – 0.0
HBV+HCV co-infection**	0	0.0	0.0 – 0.0
HBV and/or HCV negative+	283	100.0	100.0-100.0
Total	283	100	–

HBV = Hepatitis B virus; HCV = Hepatitis C virus, **Co-infection refers to participants positive for both HBV and HCV, CI = Confidence Interval, +All participants tested negative for HBV and HCV, resulting in zero prevalence of infection in this study.

4. Discussion

The present study found no detectable cases of hepatitis B or hepatitis C infection among HIV-positive adults receiving antiretroviral therapy in Kakonko District. This finding contrasts with reports from several African and Asian settings documenting substantial HIV–hepatitis co-infection burdens, where co-infection prevalence has been reported in the range of roughly 5–15% for HBV and higher frequencies for HCV among HIV-infected populations [13,14,15]. However, these findings are consistent with other studies that have reported a relatively low prevalence of HBV and HCV co-infection among HIV patients receiving ART. For example, one study reported 8.4% HBV and only 0.2% HCV co-infection among individuals on ART, with no cases of HBV/HCV co-occurrence [16,17]. These variations in prevalence across studies may reflect differences in geographic epidemiology, population risk profiles, diagnostic methods, and the duration and coverage of antiretroviral therapy programs**.**

Several factors may explain the absence of detectable hepatitis co-infection in this population. First, prolonged exposure to ART, particularly tenofovir-containing regimens, may play a significant protective role. Tenofovir has well-established antiviral activity against HBV and is widely used in first-line ART regimens in many low- and middle-income countries. Sustained use of tenofovir-based therapy can suppress HBV replication, reduce viral load, and potentially prevent the establishment or persistence of chronic HBV infection following exposure [18,15]. In the present study, nearly all participants were receiving tenofovir-based regimens, which may have contributed to the absence of detectable HBsAg in the study population.

Second, long-term engagement in HIV care may contribute to behavioral risk reduction. Patients enrolled in HIV treatment programs typically receive repeated counseling on safer sexual practices, condom use, and prevention of blood-borne infections. Evidence suggests that individuals receiving HIV treatment may adopt safer sexual behaviors and demonstrate lower rates of risky practices compared with untreated populations [19]. Such behavioral changes may reduce the transmission of other infections that share similar transmission pathways with HIV, including HBV and HCV.

At the local level, sustained HIV prevention and care initiatives implemented in Kakonko District may have further contributed to reduced transmission of viral hepatitis. These programs emphasize consistent condom use, reduction of multiple sexual partnerships, routine counseling, and adherence support for individuals receiving ART. Over time, these interventions may contribute to broader public health benefits beyond HIV control, including reductions in other sexually and blood-borne infections. The high level of ART coverage and retention in care observed among participants in this study may therefore reflect the effectiveness of integrated HIV service delivery within the district.

Another possible explanation relates to the demographic and clinical profile of the study population. A substantial proportion of participants had been on ART for more than five years, and nearly half had relatively high CD4 cell counts, suggesting stable long-term engagement in treatment and care. Individuals who remain consistently in HIV care may represent a group with better health-seeking behavior and greater exposure to preventive interventions, which may reduce their risk of acquiring additional infections over time

Despite these encouraging findings, several methodological considerations should be acknowledged when interpreting the results. The study relied on rapid

diagnostic tests for the detection of HBsAg and anti-HCV antibodies. Although these assays demonstrate high sensitivity and specificity, they may fail to detect occult HBV infection, in which viral DNA may be present despite a negative HBsAg test. Similarly, early HCV infection during the serological window period may not be detected by antibody-based assays. Therefore, the absence of positive results in this study should be interpreted as an absence of detectable infection using the available diagnostic methods rather than definitive evidence of zero prevalence in the population.

Overall, the findings suggest that integrated HIV care programs, widespread use of tenofovir-based ART regimens, and sustained prevention efforts may contribute to a reduced burden of hepatitis co-infection among people living with HIV in rural settings such as Kakonko District. Continued surveillance and further studies using more sensitive molecular diagnostic methods may help to confirm these observations and provide a more comprehensive understanding of the epidemiology of viral hepatitis in similar populations.

Limitations

This study has several limitations. First, the cross-sectional design limits causal inference. Second, hepatitis screening relied on rapid diagnostic tests, which may not detect occult HBV infection or early HCV infection during the serological window period. Molecular diagnostic tests such as HBV DNA or HCV RNA assays were not available in the study setting. Third, the achieved sample size was smaller than the initially calculated target, which may limit the precision of prevalence estimates. Finally, behavioral information such as alcohol consumption and smoking was self-reported and may be subject to recall or social desirability bias.

Conclusion

In this rural cohort of HIV-positive adults receiving antiretroviral therapy in Kakonko District, no cases of hepatitis B or hepatitis C infection were detected using rapid diagnostic testing. These findings may reflect the protective effects of long-term ART, particularly tenofovir-containing regimens, as well as sustained HIV prevention and care programs in the district. However, the possibility of undetected occult or early infection cannot be excluded. Continued integration of viral hepatitis screening within HIV care services and further studies using more sensitive diagnostic methods are recommended to confirm these findings.

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Conflict of Interest

The authors declare that they have no competing interests.

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