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Epidemiology of Hepatitis B and C Viral Infections Among Tuberculosis Patients in Ebonyi State, Nigeria

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Abstract: Tuberculosis patients coinfected with hepatitis B virus (HBV) or hepatitis C virus (HCV) may be particularly vulnerable to liver injury during treatment. Evidence on the burden and clinical implications of these infections in Ebonyi State remains limited. The aim of the study is to assess the epidemiology of Hepatitis B and C Viruses Infection among tuberculosis patients in Ebonyi State, Nigeria. The specific objectives were to (i) determine the prevalence of HBV, HCV, and HBV/HCV co-infection among tuberculosis patients in Ebonyi State, (ii) to identify common risk factors among co-infected TB-patients with viral hepatitis B and C in Ebonyi State. (iii) to determine the knowledge, attitude and practice of TB patients towards HBV and HCV infections. This study assessed HBV/HCV prevalence, risk factors, and patients' knowledge, attitudes and practices (KAP). This descriptive cross sectional study enrolled 453 confirmed TB patients from 15 treatment centres in Ebonyi State. Participants completed a structured questionnaire and were screened for HBsAg and anti-HCV. Data were analysed using SPSS version 26, with statistical significance set at $p<0.05$. Overall viral hepatitis prevalence was 2.87%. The prevalence of HBV, HCV and HBV/HCV coinfection was 2.65%, 0.44% and 0.22%, respectively. KAP levels were generally poor. Knowledge correlated positively with attitude ($r_s=0.684$) and practice ($r_s=0.592$), while attitude correlated with practice ($r_s=0.615$); all $p<0.001$. HBV and HCV occurred at low but clinically relevant levels among TB patients, with HBV predominating. The study has shown that it is imperative to screen for hepatitis B and C among TB positive patients.

Keywords: *Tuberculosis; Hepatitis B Virus; Hepatitis C Virus; Coinfection; Ebonyi State.*

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I. INTRODUCTION

Tuberculosis (TB) is a contagious and curable infectious disease yet endemic and epidemic in nature. It is primarily transmitted from person to person. Mycobacterium tuberculosis, also known as Koch's bacillus (BK) primarily affects the lungs, but it can also localize in any organ, resulting in what is known as extrapulmonary tuberculosis. Tuberculosis (TB) represents a significant global health concern, affecting every country and posing a substantial public health challenge (WHO 2025). As reported by the World Health Organization (WHO), more than ten million new cases of tuberculosis are documented each year. Globally, an estimated 10.6 million tuberculosis (TB) cases occurred in 2021 and TB is the second leading cause of death from a single infection after SARS CoV2 (WHO 2022). The 2025 Global Tuberculosis Report (WHO 2025) gives a vivid account of the TB challenge across the world. Tuberculosis

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has been listed as a disease of high public health importance in Africa and has remained among the leading cause of death worldwide (WHO, 2022).

Hepatitis is a disorder in which a virus or other mechanisms produce inflammation or swelling of the hepatocytes (liver cells), resulting in their injury or destruction. Hepatitis C virus (HCV) is a member of the family Flaviviridiae and is classified into multiple genotypes. (Joanne *et al.,* 2014), while Hepatitis B is caused by Hepatitis B virus; a hepatotrophic DNA virus of the family Hepadnaviridae. Hepatitis B and hepatitis C can either be acute or chronic. The acute form is a short-term illness that occurs within the first 6 months after a person is exposed to HBV or HCV (WHO, 2021). The diseases can become chronic, although this does not always happen and, particularly in the case of hepatitis B, the likelihood of chronicity depends on a person's age at the time of infection. Chronic hepatitis B and chronic hepatitis C are serious and can result in liver cirrhosis and a type of liver cancer, hepatocellular carcinoma (HCC). The prevention of chronic hepatitis B and chronic hepatitis C prevents the majority of HCC cases because HBV and HCV are the leading causes of this type of cancer. Also, HBV/BCV prevention is ideal for optimal treatment results in certain health conditions like tuberculosis. The African (Nigeria inclusive) and Western Pacific WHO Regions account for two thirds of HBV infections with the African Region having the largest proportion of individuals who are unaware of their infection status (WHO 2021, WHO 2017).

Hepatitis B (HBV) and hepatitis C virus (HCV) co-infections with TB are major causes of morbidity and mortality worldwide. Globally, an estimated 328 million people are chronically infected with HBV or HCV with the vast majority of people undiagnosed and untreated. (WHO 2021, WHO 2017). Despite the availability of interventions to prevent transmission, an estimated 3 million new chronic HBV and HCV infections occurred in 2019 and 1.1 million people died primarily due to HBV/HCV induced chronic liver disease and liver cancer (WHO 2021).

Although TB cases are generally treatable; there are reports of complications due to hepatotoxicity as a result of viral hepatitis in some individuals with TB (Khan *et al*., 2021). So, a good understanding of TB and HBV/HCV co-infection is important for patient management as this can affect the choice of TB drugs, pose a higher risk of experiencing adverse events related to treatment.

Yearly, global reports continue to rank Nigeria among the top burden countries for TB with Nigeria reporting second to the highest prevalence in Africa (WHO 2022). Unfortunately, Nigeria currently bears Africa's highest TB burden; it is estimated that TB incidence rate in Nigeria is 219 per 100,000 per year with male cases higher than females. (WHO, 2025).

The TB situation in Ebonyi state, south-East Nigeria has affected rural communities disproportionately, with women, children and the elderly bearing the burden of care and support for those infected and affected by the disease. Also, the state continues to suffer from inadequate human resources for health (number, skill and mix), inadequate access to TB co-morbidities (hepatitis) services (especially for the rural poor and other vulnerable groups) and high level of stigmatization of and discrimination against persons living with TB (PLTB).

➢ *Aim of the Study*

Epidemiology of Hepatitis B and C Viruses Infection Among Tuberculosis Patients in Ebonyi State, Nigeria.

➢ *Specific Objectives of the Study*

- To determine the prevalence of HBV, HCV, and HBV/HCV co-infection among tuberculosis patients in Ebonyi State.
- To identify common risk factors among co-infected TB-patients with viral hepatitis B and C in Ebonyi State.
- To describe the socio-demographic distribution of HBV and HCV co-infections among TB patients.
- To determine the knowledge, attitude and practice of TB patients towards HBV and HCV infections.

II. MATERIALS AND METHODS

➢ *Study Area*

The study was conducted in Ebonyi State which is one of the States in South-eastern Nigeria. Ebonyi State lies approximately within latitudes 5°40' and 6°45North of the Equator and longitudes 7°30' and 8°30 East of the Greenwich meridian.

➢ *Study Design*

This is a descriptive cross sectional study, conducted among TB positive patients accessing care at selected heath facilities across Ebonyi state.

➢ *Sampling Technique*

Sampling technique**:** A multistage sampling technique was employed to select study participants. In the first stage, Ebonyi State was stratified into the three senatorial zones (Ebonyi north, Ebonyi south and Ebonyi central). In the second stage, The LGAs were selected from each senatorial zone using a probability-based sampling technique. In the third stage, health facilities providing tuberculosis services were selected from the sampled LGAs. Tuberculosis patients attending the selected health facilities during the study period were randomly recruited. Questionnaire were used to extract information from the recruited subjects.

➢ *Sample Size*

The sample size was calculated using Daniel's formula. A total of 453 TB patients were recruited and screened for HBsAg and HCV antibody.

➢ *Ethical Approval*

Ethical approvals for the study were obtained from the Health Ethics and Research Committee of Ebonyi State Ministry of Health, and Mile 4 Mission Hospital Abakaliki.

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Oral consents were obtained from the respective patients that presented in the TB clinics during the course of this study.

➢ *Inclusion/Exclusion Criteria:*

The study was restricted to TB patients who consented to be enrolled in the study in the selected TB treatment centers in Ebonyi State. The study excluded non TB patients and TB patients who refused to consent to the study

➢ *Sample Collection*

Blood samples were collected aseptically from each recruited TB positive patient accessing care at the treatment facilities and taken to the laboratory within one hour for detection of HBsAg and HCV antibodies. The samples that tested positive for HBV and/or HCV were transported in cold chain to National Arborvirus and Vector Research Center (NAVRC) Enugu State for further studies. A structured questionnaire was deployed to extract information from the patients about their Knowledge, Attitude and Practice of viral hepatitis among TB patients.

➢ *HCV Antibody Testing (HCV Ab).*

This HCV antibody screening method was a visual immunoassay used to detect the presence of Hepatitis C antibodies in the samples.

➢ *Hepatitis B Surface antigen test.*

This HBsAg screening method was also a visual immunoassay used to the presence of hepatitis B surface antigen (HBsAg) from the samples

III. RESULTS

Male respondents constitute the majority at 56.51% ($n = 256$). The sample is predominant in the $30 - 49$ age bracket (38.85%), closely followed by participants aged 50 and above (37.53%). Nearly half of the participants attained a secondary level of education (49.01%). Over two-thirds of respondents are married (70.86%). A majority of respondents were receiving out-patient treatment via DOTS clinics (56.29%), with in-patient admissions accounting for 42.60%. Out of the 453 TB patients sampled in this study, 13 had at least one hepatitis virus infection, corresponding to an overall prevalence of 2.87% (95% CI: 1.68–4.85%). HBV was the most detected viral hepatitis infection, with 12 patients testing positive, giving a prevalence of 2.65% (95% CI: 1.52–4.57%). Of the total study population (N = 453) Drug-Resistant Tuberculosis (DRTB) patients comprised of 20 participants registered at the DR-TB Centre (n = 20) and Drug-Susceptible Tuberculosis (DSTB) patients comprised the larger study population (n = 433)The confidence interval indicates that, within the study population, the prevalence of HBV infection likely falls between 1.52% and 4.57%. Of the HBV-positive patients, 11 had HBV infection alone, representing 2.43% of the study population (95% CI: 1.36–4.30%). Among the total 453 enrolled Tuberculosis (TB) patients evaluated in this study, the vast majority were non-coinfected (TB only), accounting for 440 patients. Conversely, 13 patients tested positive for at least one viral hepatitis strain (either Hepatitis B, Hepatitis C, or dual infection), establishing an overall viral hepatitis coinfection prevalence of 2.87% among TB patients. Among the 14 total viral hepatitis detections identified in the study, Hepatitis B virus (HBV) constituted the primary viral biomarker, accounting for 12 cases (85.7%) of total hepatitis detections and 2.65% of all 453 enrolled patients). Hepatitis C virus (HCV) accounted for the remaining 2 cases (14.3% of total hepatitis detections; 0.44% of all 453 enrolled patients). The cumulative count of viral detections (14) exceeds the total number of coinfected patients (13) because 1 patient demonstrated dual positivity for both HBsAg and Anti-HCV markers simultaneously. Among the subset of 13 TB patients diagnosed with viral hepatitis coinfection, mono-infection with Hepatitis B virus (HBV alone) represented the predominant pattern, accounting for 11 patients (84.62%). Single infection with Hepatitis C virus (HCV alone) was observed in 1 patient (7.69%, while dual coinfection involving both HBV and HCV simultaneously was identified in 1 patient (7.69%). HBV prevalence was higher among males (3.13%) than females (2.15%), although the difference should be interpreted descriptively because the number of HBV-positive participants was small. A total of 104 participants less than or equal to the age of 30 were sampled accounting for 0.96%, 176 between ages 30 to 49 accounted for 4.55% and those above age 50 accounted for 1.76% of the HBV prevalence rate. The findings showed generally poor knowledge of TB, HBV and HCV among the participants. Only 34.88% were aware of HBV/HCV, while 57.62% were unaware. Knowledge of the transmission routes was also limited, with 20.31% identifying blood contact and 13.69% identifying sexual transmission. Regarding TB, 57.62% correctly identified airborne/germ transmission, although 29.36% were unsure. Overall, the findings indicate substantial knowledge gaps regarding TB, HBV and HCV among the participants. The participants generally demonstrated an uncertain or unfavorable attitude towards coinfection screening and prevention. More than half (51.43%) did not perceive TB and viral hepatitis coinfection as severe, while 26.05% were uncertain. Similarly, 55.85% were hesitant about routine hepatitis co-testing, compared with 26.71% who were in favour. Regarding HBV vaccination, 55.41% were hesitant, while only 26.27% indicated willingness to receive the vaccine. Preventive practices among the participants were generally inadequate. More than half (52.98%) reported never using condoms with multiple partners, while only 9.49% reported consistent use. Most participants (88.30%) were unaware of or incorrectly informed about mother-to-child transmission. Regarding hepatitis screening at TB intake, 45.25% were unsure whether they had been screened. Respiratory hygiene practices were inconsistent, with 35.98% using masks sometimes and 34.44% never using them. Similarly, 50.33% reported not consistently covering wounds or cuts. There is a strong, statistically significant positive correlation between a patient's knowledge score and their attitude score. A moderate-to-strong positive correlation exists between knowledge and actual preventive health practices. A statistically significant positive correlation was observed between favorable attitudes and positive health-seeking practices.

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By implication, patients who possess higher baseline knowledge regarding TB, HBV, and HCV are significantly more receptive to undergoing routine screening, recognizing disease severity, and accepting HBV vaccination. Favorable health perceptions and low vaccine hesitancy serve as strong psychological mediators for practicing safe infection control behavior in clinical and community settings. Younger participants (< 30 years) demonstrated statistically higher knowledge (2.12±1.62) compared to older adults aged ≥ 50 (1.42±1.5). Knowledge scores scaled directly with education level, peaking among tertiary-educated participants (2.76±1.61). Unemployed/Student participants scored significantly higher in knowledge (2.28±1.66) than employed individuals (1.67± 1.61). Tertiary-educated respondents expressed significantly higher positive attitudes (1.05± 1.19) than secondary (0.61±1.01) or primary-educated respondents (0.74±1.13). Single participants reported higher protective practices (1.99±1.34) relative to married participants (1.76± 1.37).

KAP scores were not uniform across the population. Knowledge was significantly higher among younger participants under 30 (2.12 ± 1.62) than among those aged 50 and above (1.42 ± 1.52, $p < 0.001$), and rose steadily with education, from 1.33 ± 1.55 among those with primary education or less to 2.76 ± 1.61 among tertiary-educated participants ($p < 0.001$). Unemployed or student participants also scored higher on knowledge than employed participants (2.28 versus 1.67, $p = 0.010$). Attitude followed a similar educational gradient, with tertiary-educated respondents reporting the most favourable attitudes (1.05 ± 1.19) compared to secondary (0.61 ± 1.01) and primary-educated respondents (0.74 ± 1.13, $p = 0.017$). Practice scores were comparatively more even across most demographic groups, except that single participants reported significantly better protective practices than married participants (1.99 versus 1.76, $p = 0.020$). Sex and patient care type (in-patient versus out-patient) showed no significant differences on any domain.

The Spearman correlation analysis found statistically significant positive relationships between all three domains: a strong correlation between knowledge and attitude ($rs = 0.684$, $p < 0.0001$), and moderate-to-strong correlations between knowledge and practice ($rs = 0.592$, $p < 0.0001$) and between attitude and practice ($rs = 0.615$, $p < 0.0001$). In plain terms, patients who knew more about TB, HBV and HCV tended to feel more favourably towards screening and vaccination, and those with more favourable attitudes tended to report safer practices. This statistical pattern is exactly what the FGDs illustrated in narrative form: the group with the most informed participants was also the group most receptive to vaccination and screening and the one with the best preventive practices, while the group with the weakest knowledge reported the most hesitancy and the least protective behaviour.

Table 1 Socio-Demographic Characteristics of the Study Participants

Socio-Demographic Parameter	Sub-Category	Frequency (n)	Percentage (%)
Sex	Male	256	56.51
	Female	186	41.06
	Prefer not to say	1	0.22
	Unspecified	10	2.21
Age Group (Years)	< 30	104	22.96
	30 – 49	176	38.85
	≥ 50	170	37.53
Highest Education Level	Primary or Less	121	26.71
	Secondary	222	49.01
	Tertiary	62	13.69
	Unspecified	48	10.60
Marital Status	Single	110	24.28
	Married	321	70.86
	Divorced / Widowed	3	0.66
	Unspecified	19	4.19
Employment Status	Employed / Self-Employed	283	62.47
	Informal (Others)	104	22.96
	Unemployed / Student	54	11.92
	Unspecified	12	2.65
Patient Care Type	Out-Patient (DOTS Clinic)	255	56.29
	In-Patient (Hospital Ward)	193	42.60
	Unspecified	5	1.10

Table 2 Characteristics of Participants Showing DRTB and DSTB Categories

Demographic / Clinical Characteristic	DRTB Cohort (n=20)	DSTB Cohort (n=433)	Total Population (N=453)	p-value
Sex				**0.031**

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• Male	17 (85.0%)	239 (55.2%)	256 (56.5%)	
• Female	3 (15.0%)	183 (42.3%)	186 (41.1%)	
• Unspecified	0 (0.0%)	11 (2.5%)	11 (2.4%)	
Age Group				**0.616**
• <30 years	3 (15.0%)	101 (23.3%)	104 (23.0%)	
• 30–49 years	7 (35.0%)	169 (39.0%)	176 (38.9%)	
• ≥50 years	9 (45.0%)	161 (37.2%)	170 (37.5%)	
• Unformatted Age	1 (5.0%)	2 (0.5%)	3 (0.7%)	
Marital Status				**0.784**
• Married	15 (75.0%)	306 (70.7%)	321 (70.9%)	
• Single	5 (25.0%)	105 (24.2%)	110 (24.3%)	
• Separated	0 (0.0%)	3 (0.7%)	3 (0.7%)	
• Unspecified	0 (0.0%)	19 (4.4%)	19 (4.2%)	
Patient Care Setting				**0.039**
• Inpatient	14 (70.0%)	179 (41.3%)	193 (42.6%)	
• Outpatient	6 (30.0%)	249 (57.5%)	255 (56.3%)	
• Unspecified	0 (0.0%)	5 (1.2%)	5 (1.1%)	
Hepatitis B (HBV) Status				**1.000**
• Positive	0 (0.0%)	12 (2.8%)	12 (2.6%)	
• Negative	20 (100.0%)	421 (97.2%)	441 (97.4%)	
Hepatitis C (HCV) Status				**1.000**
• Positive	0 (0.0%)	2 (0.5%)	2 (0.4%)	
• Negative	20 (100.0%)	431 (99.5%)	451 (99.6%)	

Table 3 Summary of Prevalence of TB/Hepatitis Coinfection in Patients (N = 453)

Infection status	frequency	Prevalence	95% CI
HBV positive	12	2.65%	1.52–4.57%
HCV positive	2	0.44%	0.12–1.60%
HBV alone	11	2.43%	1.36–4.30%
HCV alone	1	0.22%	0.04–1.24%
HBV/HCV co-infection	1	0.22%	0.04–1.24%
Overall viral hepatitis positivity	13	2.87%	1.68 – 4.85%

The dataset indicates that 12/453 (2.65%) were HBV-positive, 2/453 (0.44%) were HCV-positive, and only 1/453 (0.22%) had HBV/HCV co-infection.

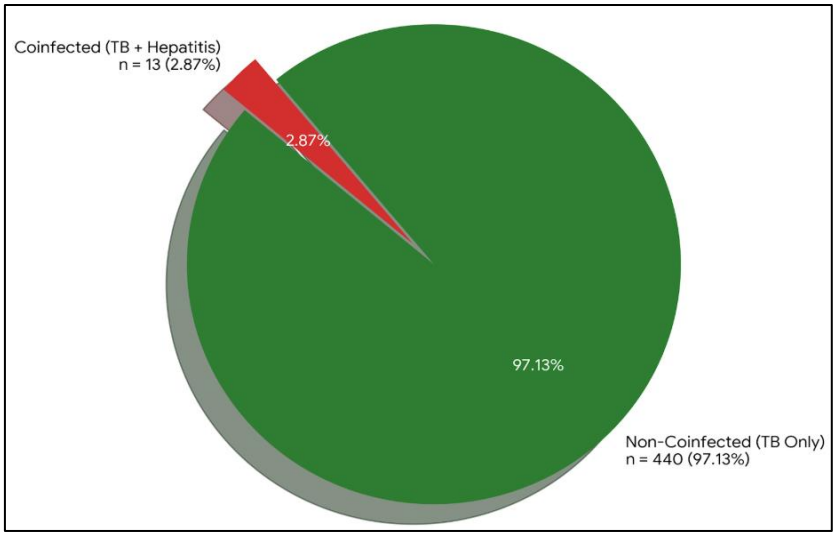


Fig 1 Total Viral Hepatitis Positivity Breakdown

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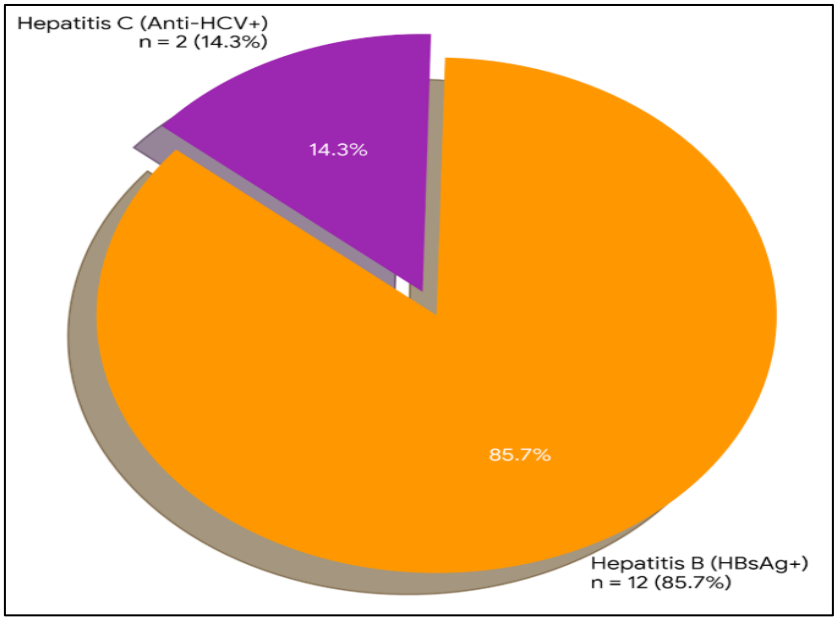


Fig 2 Specific Infection Types Among Coinfected Patients

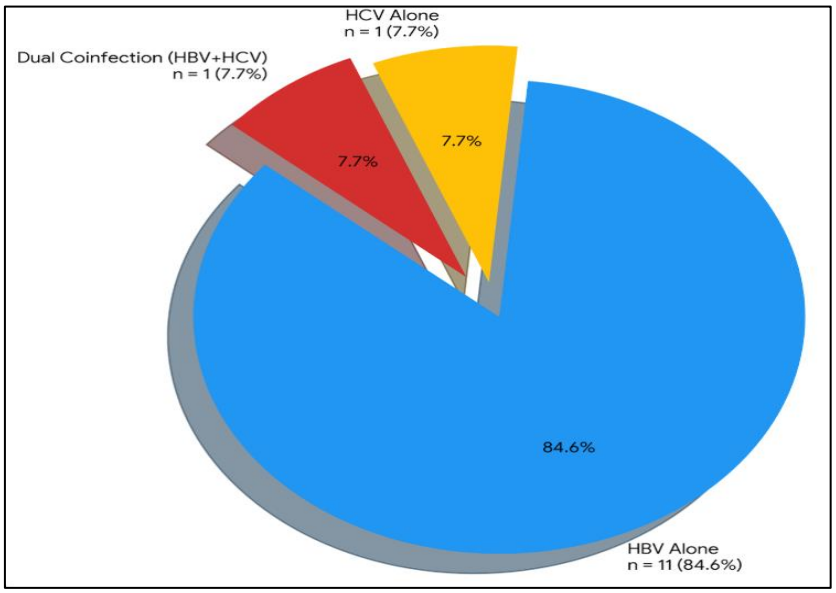


Fig 3 HBV Sex-Specific Prevalence

Table 4 HBV Sex-Specific Prevalence

Sex	HBV positive (n)	Total (N)	Prevalence	95% CI
Male	8	256	3.13%	1.59 – 6.04
Female	4	186	2.15%	0.84 – 5.40
Prefer not to say	0	1	0.00	0.00 – 79.35
Total	12	453	2.65%	1.52 – 4.71

Table 5 HCV Sex-Specific Prevalence

Sex	HCV positive (n)	Total (N)	HCV prevalence %	95% CI
Male	2	256	0.78	0.21–2.80
Female	0	186	0.00	0.00–2.02
Prefer not to say	0	1	0.00	0.00–79.35
Overall	2	453	0.44	0.12–1.60

Table 6 Age-Specific HBV Prevalence

Age group	Positive Cases (n)	Total Tested (N)	HBV Prevalence (%)	95% CI
<30 years	1	104	0.96%	0.17% – 5.25%

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30–49 years	8	176	4.55%	2.32% – 8.71%
≥50 years	3	170	1.76%	0.60% – 5.06%
Unspecified	0	3	0.00%	0.00% – 56.15%

Table 7 Age-Specific HCV Prevalence

Age group	Positive cases (n)	Total (N)	HBV Prevalence (%)	95% CI
<30 years	0	104	0.00%	0.00% – 3.56%
30–49 years	0	176	0.00%	0.00% – 2.14%
≥50 years	2	170	1.18%	0.32% – 4.19%
Unspecified	0	3	0.00%	0.00% – 56.15%

Table 8 Summary of KAP Composite Scores

KAP Domain	Number of Items	Mean Score (±SD)	Percentage of mean Score	Overall Qualitative Rating
Knowledge Domain	5	1.77 ± 1.64	35.3%	Poor / Deficient
Attitude Domain	3	0.75 ± 1.10	25.2%	Unfavorable / Hesitant
Practice Domain	5	1.84 ± 1.37	36.8%	Poor / Unsafe

Table 9 Knowledge Assessment Regarding TB, HBV, and HCV ($N = 453$)

Survey Question Item	Response Option	Frequency (n)	Percentage (%)	Knowledge Evaluation
Awareness of Hepatitis B/C Viruses	No	261	57.62%	Deficient
	Yes	158	34.88%	Correct
	Not Sure / Missing	34	7.50%	Uninformed
Transmission Routes of HBV/HCV	Don't Know / Unaware	282	62.25%	Deficient
	Blood Contact	92	20.31%	Correct
	Sexual Transmission	62	13.69%	Correct
	Airborne	14	3.09%	Misconception
Perceived Coinfection Susceptibility	Maybe / Uncertain	234	51.66%	Ambiguous
	No	99	21.85%	Incorrect
	Yes	95	20.97%	Correct
	Don't Know / Missing	25	5.52%	Uninformed
Prior Knowledge of TB Diagnosis	No	237	52.32%	Deficient
	Yes	132	29.14%	Correct
	Unsure / Maybe / Missing	84	18.54%	Uninformed
TB Transmission Mechanics	Airborne / Germs	261	57.62%	Correct
	Not Sure	133	29.36%	Uninformed
	Sexual Contact	40	8.83%	Misconception
	Supernatural / Gods / Missing	19	4.19%	Misconception

Table 10 Attitude Assessment Towards Coinfection Screening and Prevention (N = 453)

Survey Question Item	Response Option	Frequency (n)	Percentage (%)	Attitudinal Classification
Perceived Coinfection Severity	No (Not Severe)	233	51.43%	Unfavorable
	Yes (Severe)	102	22.52%	Favorable
	Uncertain / Maybe / Missing	118	26.05%	Hesitant
Acceptance of Routine Hepatitis Co-Testing	Maybe / Hesitant	253	55.85%	Uncertain
	Yes (In Favor)	121	26.71%	Favorable
	No (Opposed) / Missing	79	17.44%	Unfavorable
Willingness to Receive HBV Vaccine	Maybe / Hesitant	251	55.41%	Uncertain
	Yes (Willing)	119	26.27%	Favorable
	No (Refuse) / Missing	83	18.32%	Unfavorable

Table 11 Preventive Practice Assessment among Participants ($N = 453$)

Survey Question Item	Response Option	Frequency (n)	Percentage (%)	Practice Standard
Condom Use with Multiple Partners	Never	240	52.98%	Unsafe
	Sometimes	138	30.46%	Inconsistent

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	Yes (Consistently)	43	9.49%	Safe
	No Partner / Missing	32	7.07%	Non-applicable
Awareness/Practice on Mother-to-Child Spread	No (Unaware / Incorrect)	400	88.30%	Unsafe / Deficient
	Yes (Aware) / Missing	53	11.70%	Safe
Screening Completed at TB Intake	Not Sure	205	45.25%	Uncertain
	Yes (Screened)	130	28.70%	Adherent
	No (Not Screened) / Missing	118	26.05%	Non-adherent
Respiratory Hygiene (Mask Usage)	Sometimes	163	35.98%	Inconsistent
	No (Never)	156	34.44%	Unsafe
	Yes (Consistently)	120	26.49%	Safe
	Missing	14	3.09%	—
Blood Safety (Covering Wounds/Cuts)	No (Unprotected)	228	50.33%	Unsafe
	Yes (Consistently Cover)	133	29.36%	Safe
	Sometimes	75	16.56%	Inconsistent
	Missing	17	3.75%	—

Table 12 Spearman's Correlation Matrix Between Knowledge, Attitude, and Practice Scores

Domain Pair	Correlation Coefficient (rs)	p-value	Relationship Strength	Statistical Significance
Knowledge vs. Attitude	+0.684	<0.0001	Strong Positive Correlation	Statistically Significant
Knowledge vs. Practice	+0.592	<0.0001	Moderate-to-Strong Positive Correlation	Statistically Significant
Attitude vs. Practice	+0.615	<0.0001	Moderate-to-Strong Positive Correlation	Statistically Significant

Table13 Bivariate Analysis of KAP Scores by Socio-Demographic Characteristics

Socio-Demographic Metric	Category	n (%)	Mean Knowledge (±SD)	Knowledge p-value	Mean Attitude (±SD)	Attitude p-value	Mean Practice (±SD)	Practice p-value
Sex	Male	256(57.9)	1.81±69	0.514[a]	0.71±1.7	0.290[a]	1.88±1.6	0.768[a]
	Female	186(42.08)	1.70±161		0.83±1.6		1.84±1.7	
Age Group (Years)	< 30	104(23.11 %)	2.12±162	<0.001[b]	0.77±1.01	0.975[b]	2.05±1.35	0.161[b]
	30 – 49	176(39.11 %)	1.90±1.71		0.74±1.12		1.82±1.36	
	≥ 50	170(37.78 %)	1.42±1.52		0.75±1.15		1.72±1.38	
Education Level	Primary or Less	121(29.88 %)	1.33±1.55	< 0.001[b*]	0.74±1.13	< 0.017 [b*]	1.84±1.32	0.716[b]
	Secondary	222(54.81 %	1.68±1.59		0.61±1.01		1.94±1.25	
	Tertiary	62(15.31%)	2.76±1.61		1.05±1.19		2.00±1.59	
Marital Status	Single	110(25.35 %)	2.05±1.67	0.064[b]	0.72±1.01	0.625[b]	1.99±1.34	0.020[b*]
	Married	321(73.96 %)	1.66±1.61		0.74±1.11		1.76±1.37	
	Divorced/Widowed/separated	3(0.69%)	2.67±1.15		1.33±1.53		3.67±1.53	
Employment	Employed	387(87.76 %)	1.67±1.61	0.010[a*]	0.71±1.09	0.447[a]	1.80±1.34	0.464[a]
	Unemployed	54(12.24%)	2.28±1.66		0.83±1.09		1.94±1.57	
Patient Care Type	Out-Patient (DOTS)	255(56.92 %	1.73±1.67	0.548[a]	0.76±1.10	0.997[a]	1.85±1.42	0.937[a]
	In-Patient (Ward)	193(43.08 %)	1.82±1.62		0.76±1.12		1.84±1.32	

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Key: superscript a = analysis via independent sample t-test; superscript b = one way ANOVA. Superscript (*) indicates significant effect at statistical significant of 0.05

IV. DISCUSSIONS

The findings indicate that viral hepatitis occurred among tuberculosis patients receiving care in Ebonyi State, although the burden was lower than that described in the principal Nigerian and local studies reviewed. Hepatitis B was more prominent than hepatitis C, while simultaneous infection with both viruses was uncommon. This relative predominance of HBV is consistent with the broader epidemiological pattern reported for Nigeria and sub-Saharan Africa, where HBV remains more widespread than HCV (WHO, 2024; Olakunde *et al*., 2025). The occurrence of all three infection categories nevertheless shows that TB services encounter patients with different forms of viral-hepatitis exposure and should not regard either virus as irrelevant merely because the observed prevalence was low.

The 2.65% HBV prevalence was below the 5.6% reported among TB patients in Jos by Agabi *et al.* (2023), the 8.3% reported among HIV-negative TB patients in Ebonyi State by Ogudu *et al.* (2024), and the 10.3% found among adult outpatients in Abakaliki by Nweke (2025). It was also lower than the national estimates cited by Olayinka *et al.* (2016) and Olakunde *et al*. (2025). The 0.44% HCV prevalence followed the same comparative direction, remaining below the 2.8% recorded among TB patients in Jos and the national estimates discussed (Agabi *et al*., 2023; Musa *et al*., 2015). These consistent differences suggest that the population enrolled in the present study had a comparatively lower detectable burden than the populations examined in the earlier reports.

The variation does not necessarily indicate disagreement among the studies because the populations and sampling contexts were not equivalent. Ogudu *et al.* (2024) recruited HIV-negative TB patients from two facilities, Nweke (2025) examined general adult outpatients, and the present study drew TB patients from care facilities across the state. Variation in participant composition, exposure histories, hepatitis vaccination, access to screening, diagnostic approaches and periods of data collection could alter the proportion detected in each setting. The present finding is therefore best understood as a lower burden within the enrolled TB population rather than evidence against the established endemicity of HBV and HCV in Nigeria.

The concentration of infections among men agrees with the male predominance reported by Nweke (2025) in Ebonyi State. This pattern may reflect sex-related differences in occupational exposure, sexual behaviour, traditional procedures involving sharp instruments or use of health services. The concentration of HBV in middle adulthood is compatible with the accumulation of sexual, medical and culturally mediated exposures during economically and socially active years. By contrast, the occurrence of HCV among older participants accords with the predominantly blood-borne transmission of HCV and the possibility of cumulative exposure to transfusion, unsafe injections, medical procedures or shared sharp instruments over time (Mohd Suan *et al*., 2019; WHO, 2020).

The occurrence of detected infections within routine drug-susceptible TB care demonstrates that viral-hepatitis assessment is relevant beyond specialist drug-resistant TB programmes. This is clinically important because the standard drug-susceptible regimen contains agents with recognised hepatotoxic potential, particularly isoniazid, rifampicin and pyrazinamide. Identifying underlying viral hepatitis within ordinary TB care can therefore provide useful context for interpreting biochemical changes during treatment.

The behavioural pattern observed in the study provides a plausible context for continued transmission. Limited condom use, poor recognition of sexual and mother-to-child transmission, inconsistent protection of cuts and uncertainty about hepatitis screening correspond with the blood and body-fluid routes described. Nweke (2025) similarly associated HBV infection with multiple sexual partnerships and local circumcision in an Ebonyi State outpatient population. The agreement between the present behavioural pattern and the local literature suggests that exposure prevention among TB patients should address sexual practices, unsafe injections, scarification, tattooing, circumcision and contact with contaminated sharp instruments as connected rather than isolated risks.

Overall, the knowledge domain was rated poor, with a mean percentage score that fell below the 50% threshold used to classify a domain as deficient. More than half of participants (57.6%) could not correctly describe basic awareness items on HBV/HCV, and a similar proportion (62.3%) did not know how these viruses are transmitted. This is not a minor gap; not knowing that HBV and HCV spread mainly through blood and body fluid contact leaves patients unable to judge their own risk or to take sensible precautions in daily life. A comparable pattern was reported among market traders in Lagos, where a large share of respondents could not correctly identify HBV transmission routes, prompting the authors to call for more deliberate awareness campaigns targeted at ordinary community members rather than only healthcare workers (Adejimi et al., 2021). More recent work among young adults in Lagos similarly found that good HBV knowledge, while present in the majority, still left substantial gaps in awareness of screening sites and vaccination access (Ladi-Akinyemi et al., 2026), reinforcing that awareness of a disease's existence does not automatically translate into awareness of how to act on it.

The attitude domain was rated unfavourable overall, and the pattern here is less about outright rejection and more about ambivalence. Across all three attitude items, the modal response was uncertainty rather than opposition: 51.4% were unsure whether coinfection is severe, 55.9% were hesitant about routine hepatitis co-testing, and 55.4% gave the same hesitant response to HBV vaccination, Stigma deserves particular attention here: when a disease is associated with shame or moral judgement, patients are less likely to seek

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testing or disclose risk behaviour, which would help explain why so many respondents preferred the safety of an uncertain response over a definite yes or no. This aligns closely with two Lagos-based studies that examined TB-associated stigma directly and found it pervasive even among respondents who otherwise demonstrated reasonable disease knowledge, with the authors concluding that stigma, rather than ignorance alone, was a major barrier to open engagement with screening and care (Oladele *et al.,* 2020; Kanma-Okafor *et al.,* 2021). This shortfall between awareness and action is not unique to this population. Among cleaning staff in a Nigerian tertiary hospital, a majority failed to recognise all HBV transmission and prevention routes despite working in a clinical environment, and the authors attributed low preventive practice directly to this residual lack of awareness rather than to indifference (Abiodun *et al.,* 2019). Similarly, the Lagos young-adult study found that although a majority demonstrated good knowledge and positive perceptions of HBV, actual preventive practice remained inadequate, with the large majority still unscreened and unvaccinated, largely because they did not know where to access these services (Ladi-Akinyemi *et al.,* 2026). The present findings sit within that same pattern: knowing a behaviour is protective is evidently not sufficient on its own to produce it, particularly where structural barriers such as service availability, cost, or simple lack of direction compound the problem. In the urban slum study in Lagos, good TB knowledge was found to be a statistically significant predictor of both positive attitude and good practice, leading the authors to conclude that improving community-level TB education would ultimately raise detection and treatment rates (Balogun *et al.,* 2019). Likewise, the market-trader study on HBV found that respondents' knowledge and attitude were significantly associated with their preventive practices, and recommended that awareness, screening and vaccination programmes be pursued together rather than in isolation (Adejimi *et al.,* 2021).

Practice was also rated poor, and arguably reflects the most consequential gap because it is where knowledge and attitude are supposed to translate into protective action. Only 9.5% of participants reported consistent condom use with multiple partners, while over half (53.0%) never used condoms in that context. Awareness and practice around mother-to-child transmission were particularly weak, with 88.3% giving unsafe or incorrect responses. Screening uptake at TB intake was uneven, with 45.3% unsure whether they had even been screened for HBV/HCV, a finding that again implicates service delivery rather than patient motivation alone. Respiratory hygiene and blood-safety practices, such as consistent mask use and covering wounds, were each practised consistently by only around a quarter to a third of respondents.

This shortfall between awareness and action is not unique to this population. Among cleaning staff in a Nigerian tertiary hospital, a majority failed to recognise all HBV transmission and prevention routes despite working in a clinical environment, and the authors attributed low preventive practice directly to this residual lack of awareness rather than to indifference (Abiodun *et al.,* 2019). Similarly, the Lagos young-adult study found that although a majority demonstrated good knowledge and positive perceptions of HBV, actual preventive practice remained inadequate, with the large majority still unscreened and unvaccinated, largely because they did not know where to access these services (Ladi-Akinyemi *et al.,* 2026). The present findings sit within that same pattern: knowing a behaviour is protective is evidently not sufficient on its own to produce it, particularly where structural barriers such as service availability, cost, or simple lack of direction compound the problem.

V. CONCLUSION

This study established that HBV, HCV and HBV/HCV coinfection occurred among TB patients enrolled for care in Ebonyi State, although the detected burden was lower than that reported in the local and national literature reviewed. HBV was more prevalent than HCV, while dual infection was uncommon. KAP of was observed to be generally poor among the recruited participants

RECOMMENDATIONS

- Based on the findings of this study, the following recommendations are made:
- Routine HBV and HCV screening should be incorporated into the enrolment assessment of TB patients in health facilities in Ebonyi State, using HBsAg and anti-HCV tests as the initial screening methods.
- Hepatitis education should be integrated into routine TB counselling. Educational messages should distinguish the airborne transmission of TB from the blood-borne, sexual and perinatal transmission of HBV and HCV. They should also address unsafe injections, shared sharp instruments, scarification, tattooing, circumcision, blood exposure and unsafe sexual practices.
- TB-control programmes should establish clear referral and follow-up pathways connecting TB clinics, laboratory services and viral-hepatitis care providers. This would ensure that patients with confirmed infection or abnormal liver-enzyme profiles receive appropriate evaluation and are not lost after screening.

REFERENCES

[1.] Agabi, Y. A., Onyedikachukwu, A. J., Udeogu, K. E., Chukwu, C., Nkup, J. Y., Okojokwu, O.J., Kufre, J. O. and Simji, S. G. (2023). Coinfections with hepatitis B virus and hepatitis C virus among tuberculosis patients in Jos, Nigeria. *Sri Ramachandra Journal of Health Science,* 3:148.

[2.] Joanne, M., Willey, L.M., Sherwood, C.J., and Woolverton. (2014). *Prescott's Microbiology,* McGraw-Hill Education, 9th edition. Pg 875-877

[3.] Khan, A. F., Sajjad, A., Mian, D. A., Tariq, M. M., Jadoon, U. K. and Abbas, M. (2021). Co-infection with hepatitis B in tuberculosis patients on anti-tuberculosistreatment and the final outcome *Cureus,* 13:14433.

[4.] Mohd Suan, M. A., Said, S. M., Lim, P. Y., Azman, A. Z. F. and Abu Hassan, M.R. (2019) Risk factors for

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26oct339

hepatitis C infection among adult patients in Kedah state, Malaysia: A case–control study. *PLoS ONE,* 14(10):224459

[5.] Musa, B. M., Bussell, S., Borodo, M. M., Samaila, A. A., and Femi, O. L. (2015). The epidemiology of hepatitis C virus infection in Nigeria: A systematic review and meta-analysis. *PLOS ONE,* 10(8):140240.

[6.] Nweke, I. C. (2025). Determination of seroprevalence of hepatitis B virus infection and associated risk factors among adult patients at a tertiary hospital in Ebonyi State. *International Journal of Research and Innovation in Social Science*, 9(26): 8684–8691.

[7.] Ogudu, E. O, Udeani, T.K, Egwurochi, W. I, Ozochikelu, C.C, Egbule, C.U, (2024) Prevalence of Hepatitis B Virus Infection Among

[8.] Tuberculosis Patients In Ebonyi State. *ISRG Journal of Multidisciplinary Studies ISSN:* 2584-0452

[9.] Olakunde, B. O., Adeyinka, D. A., Olakunde, O. A., Eneh, S. C., and Ogundipe, T. (2025). Epidemiology of hepatitis B virus infection in Nigeria: A narrative review of prevalence, transmission, genotypes, coinfections, and mortality. *Journal of Tropical Medicine*, 2025, 4939367.

[10.] World Health Organization. (2017). Global Hepatitis Report. *World Health Organization 2017* [Last accessed on 2019 Jan 22]

[11.] World Health Organization. (2020). Hepatitis C Fact Sheets, Available:https://www.who.int/news-room/fact sheets/detail/hepatitis-c [Retrieved January, 2021]

[12.] World Health Organization (WHO) issuing updated guidelines for treatment of hepatitis C infection. (2021). Available: https://www.who.int/hepatitis/news-events/hepatitis-c-guidelines-2016-story/en/ Retrieved on 06/05/21

[13.] World Health Organization. (2021). *WHO consolidated guidelines on tuberculosis: Module 3: Diagnosis—rapid diagnostics for tuberculosis detection*. Geneva: World Health Organization.

[14.] World Health Organization. (2022). Tuberculosis. Geneva: *World Health Organization;* 2022 Available from: [Last accessed on 2023 Jun 06]

[15.] World Health Organization. (2024). Global hepatitis report 2024: Action for access in low- and middle-income countries.

[16.] World Health Organization. (2025). Global tuberculosis report 2025.