

EPIDEMIOLOGY OF HEPATITIS B AND C AMONG UNDERSERVED RURAL POPULATIONS IN BENUE STATE, NIGERIA

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Abstract

Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections remain important causes of chronic liver disease worldwide, with a disproportionate burden among populations experiencing limited access to healthcare services. This study assessed the epidemiology of hepatitis B and C infections among underserved rural populations in Benue State, Nigeria. A community-based cross-sectional study was conducted among adults residing in selected rural communities across three senatorial districts of the state. Blood samples were collected and tested for hepatitis B surface antigen (HBsAg) and anti-hepatitis C virus antibodies using rapid diagnostic methods, with reactive samples confirmed using enzyme-linked immunosorbent assay. Sociodemographic characteristics,

behavioural factors, healthcare access, and possible routes of exposure were assessed using structured questionnaires. The study recorded measurable prevalence of both HBV and HCV infections among participants, with HBV occurring more frequently than HCV. Higher infection rates were observed among individuals with previous exposure to unsafe medical procedures, limited awareness of viral hepatitis, and inadequate access to preventive health services. The findings demonstrate that rural populations in Benue State remain vulnerable to viral hepatitis transmission due to gaps in screening, vaccination coverage, and health education. Strengthening community-based testing, hepatitis B vaccination programmes, and rural healthcare delivery is recommended to reduce the burden of viral hepatitis.

Keywords: Benue State, Hepatitis B, Hepatitis C, Nigeria, Rural population

Introduction

Viral hepatitis continues to pose a major public health challenge because millions of people worldwide live with chronic infection without knowing their status. Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections are particularly important because they may remain asymptomatic for years while gradually causing liver inflammation, fibrosis, cirrhosis, and hepatocellular carcinoma (World Health Organization [WHO], 2024).

Globally, hepatitis B infection remains one of the most common chronic viral infections, with substantial disease burden in sub-Saharan Africa. The region continues to experience high levels of HBV transmission due to factors such as inadequate vaccination coverage, limited screening services, unsafe healthcare practices, and gaps in public awareness (WHO, 2024). Hepatitis C infection, although less common than HBV in many African settings, remains a significant concern because chronic infection can progress silently and may only be detected after advanced liver damage occurs.

Nigeria is considered a high-burden country for hepatitis B, with considerable regional variations in prevalence. Several studies have reported that HBV and HCV infections remain widespread among different population groups, including blood donors, pregnant women, healthcare workers, and rural residents (Forbi et al., 2007; Musa et al., 2015). The burden is influenced by socioeconomic conditions, healthcare accessibility, cultural practices, and availability of preventive interventions.

Rural populations often experience additional barriers that increase vulnerability to viral hepatitis. Limited access to diagnostic facilities, inadequate health education, low vaccination uptake, and dependence on informal healthcare providers may delay diagnosis and treatment. In some communities, traditional practices involving skin piercing, scarification, and unsafe procedures

may also contribute to transmission risks. Benue State provides an important setting for studying hepatitis epidemiology because a substantial proportion of its population resides in rural communities where healthcare access remains uneven. The state has diverse communities involved mainly in agricultural activities, and many residents depend on primary healthcare facilities that may have limited capacity for routine hepatitis screening.

Previous Nigerian studies have largely focused on specific groups such as blood donors, pregnant women, or hospital-based populations. Less attention has been given to underserved rural communities where social and healthcare factors may influence infection patterns. Understanding hepatitis prevalence and associated factors in these populations is important for designing interventions that reach individuals who may not regularly interact with formal healthcare systems. Environmental and public health research in Nigeria has shown that social conditions, healthcare accessibility, and community-level factors influence exposure to infectious diseases. Ugbede and colleagues have highlighted the importance of strengthening preventive health approaches and addressing community vulnerabilities when managing public health challenges. Such considerations are relevant to viral hepatitis control, particularly in underserved populations where prevention depends heavily on community-based strategies.

This study therefore assessed the epidemiology of hepatitis B and C infections among underserved rural populations in Benue State, Nigeria. The study determined the prevalence of HBV and HCV infections, examined associated sociodemographic and behavioural factors, and assessed awareness and preventive practices related to viral hepatitis.

Literature Review

1 Conceptual Review

Hepatitis B Virus Infection

Hepatitis B virus is a DNA virus belonging to the family *Hepadnaviridae*. Infection occurs through contact with infected blood and body fluids. Transmission routes include mother-to-child transmission during childbirth, sexual exposure, unsafe injection practices, transfusion of unscreened blood, and use of contaminated instruments. The progression of HBV infection depends on several factors, including age at infection, immune response, viral characteristics, and access to treatment. Individuals infected early in life are more likely to develop chronic infection compared with adults who acquire the virus later (WHO, 2024).

Hepatitis C Virus Infection

Hepatitis C virus is an RNA virus primarily transmitted through blood exposure. Common routes include unsafe injection practices, contaminated medical equipment, and unscreened blood transfusion. Unlike HBV, there is currently no widely available preventive vaccine for HCV,

making early detection and treatment essential components of control. The introduction of direct-acting antiviral medicines has improved treatment outcomes; however, access remains limited in many low-resource settings.

Rural Health Inequalities and Viral Hepatitis

Rural communities often experience healthcare disadvantages that influence infectious disease outcomes. Geographic distance from healthcare facilities, financial barriers, and limited availability of laboratory services may reduce opportunities for screening and early treatment.

These challenges are particularly important for diseases such as hepatitis B and C because many infected individuals remain unaware of their status until complications develop.

2 Theoretical Review

Health Belief Model

This study was guided by the Health Belief Model (HBM), which explains how individual beliefs influence health-related behaviours, including disease prevention, screening, and treatment-seeking practices. The model proposes that individuals are more likely to adopt preventive actions when they perceive themselves as vulnerable to a disease, recognise the seriousness of the condition, believe that preventive measures are beneficial, and perceive barriers to action as manageable (Rosenstock et al., 1988).

The Health Belief Model is relevant to hepatitis B and C prevention because infection control depends largely on individual awareness, acceptance of screening, vaccination uptake, and willingness to seek healthcare services. In rural communities, perceptions regarding hepatitis transmission, cultural beliefs, healthcare costs, and accessibility may influence whether individuals participate in preventive programmes. For example, a person who does not consider hepatitis a serious health problem may be less likely to accept testing even when services are available. Similarly, individuals who understand the benefits of hepatitis B vaccination may be more willing to access immunisation services. Applying this model helps explain how knowledge, perceived risk, and social conditions influence hepatitis prevention behaviours among underserved populations.

3 Empirical Review

Several studies have examined the prevalence and distribution of hepatitis B and C infections among Nigerian populations. Forbi et al. (2007) reported considerable HBV infection rates among Nigerian populations and highlighted the continued importance of prevention strategies in reducing transmission. Similarly, Musa et al. (2015), in a systematic review of hepatitis B infection

in Nigeria, identified substantial geographical variation in prevalence and emphasised the need for expanded vaccination and screening programmes.

Studies among rural and semi-urban populations have shown that limited awareness and poor access to healthcare services contribute to persistent viral hepatitis transmission. Many infected individuals remain undiagnosed because routine hepatitis screening is not consistently integrated into primary healthcare services.

Research among pregnant women, blood donors, and healthcare-related populations in Nigeria has demonstrated that HBV remains more prevalent than HCV in many settings. This pattern reflects the long-standing endemicity of HBV transmission in the country and differences in transmission pathways between the two viruses. In Benue State, previous studies have reported the presence of hepatitis infections among different population groups, although available evidence has largely focused on hospital-based or specific occupational populations. Rural communities remain comparatively understudied despite facing challenges that may influence infection risk.

The importance of community-level prevention has also been emphasised in Nigerian public health research. Ugbede and colleagues have contributed to discussions on environmental and social factors influencing health outcomes in underserved communities, highlighting that prevention programmes must consider local conditions, access barriers, and community participation. Such considerations are important when developing viral hepatitis control strategies for rural populations. Despite existing evidence, information regarding the combined epidemiological profile of hepatitis B and C among underserved rural populations in Benue State remains limited. This study addresses this gap by examining infection prevalence, associated factors, and preventive practices among rural residents.

Methods

1 Research Design

A community-based cross-sectional study design was employed to determine the epidemiology of hepatitis B and C infections among underserved rural populations in Benue State, Nigeria. The design allowed assessment of infection prevalence and associated risk factors at a specific period among individuals living in selected rural communities.

2 Study Area

The study was conducted in Benue State, located in the North-Central region of Nigeria. The state is commonly referred to as the food basket of Nigeria due to its extensive agricultural activities. It has 23 local government areas and a population distributed across urban centres and numerous rural settlements.

Benue State experiences a tropical climate with distinct rainy and dry seasons. Many residents depend on farming as their primary occupation, and rural communities often experience challenges related to healthcare accessibility, transportation, and availability of specialised medical services.

Three rural communities were selected from the senatorial districts of the state:

1. Gwer East Local Government Area (Benue North-East Senatorial District).
2. Agatu Local Government Area (Benue South Senatorial District).
3. Kwande Local Government Area (Benue North-East Senatorial District).

The selected communities were chosen because of their predominantly rural characteristics and limited access to routine hepatitis screening services.

3 Study Population

The study population consisted of adults aged 18 years and above residing in selected rural communities of Benue State.

Participants included farmers, traders, artisans, and other community residents who had lived in the selected communities for at least six months.

4 Sample Size Determination

The sample size was determined using the Cochran formula for estimating sample size in prevalence studies.

A total of 420 participants were recruited for the study after considering a previous estimated hepatitis prevalence, allowable error margin, and possible non-response.

5 Sampling Technique

A multistage sampling technique was used.

In the first stage, selected rural local government areas were identified. In the second stage, communities were selected using simple random sampling. In the final stage, households were selected systematically, and eligible adults were recruited.

This approach ensured representation of individuals from different rural settings within the state.

6 Inclusion and Exclusion Criteria

Participants included in the study were:

1. Adults aged 18 years and above.

2. Residents of selected communities for at least six months.
3. Individuals who provided informed consent.
4. Individuals excluded from the study were:
5. Persons unwilling to provide blood samples.
6. Individuals temporarily visiting the communities.
7. Participants with incomplete questionnaire information.

7 Data Collection Instruments

Data were collected using a structured interviewer-administered questionnaire developed from previous hepatitis epidemiological studies.

The questionnaire collected information on:

1. Sociodemographic characteristics.
2. Awareness of hepatitis B and C.
3. Previous hepatitis testing.
4. Vaccination history.

Possible exposure factors such as blood transfusion, traditional practices, and medical procedures.

Blood samples were collected for laboratory testing.

8 Laboratory Sample Collection and Analysis

Five millilitres of venous blood was collected from each participant by trained laboratory personnel using sterile disposable syringes. The samples were transferred into labelled plain sample containers and transported in cold conditions to the laboratory for analysis. Serum was separated through centrifugation and tested for hepatitis B surface antigen (HBsAg) and hepatitis C virus antibodies (anti-HCV). Initial screening was performed using commercially available rapid diagnostic test kits according to the manufacturer's instructions.

Samples that tested positive during screening were subjected to confirmatory testing using enzyme-linked immunosorbent assay (ELISA) techniques. Laboratory procedures were conducted using standard operating procedures to maintain accuracy and consistency.

Participants who tested positive were counselled and referred to appropriate healthcare facilities for further evaluation and management.

9 Validity and Reliability

The questionnaire was reviewed by specialists in epidemiology, medical laboratory science, and public health to ensure that the questions adequately addressed the study objectives.

A pre-test was conducted among residents of a rural community outside the selected study locations. Feedback from the pre-test was used to improve clarity and reduce ambiguity in the questionnaire. Laboratory reliability was ensured through proper sample handling, use of quality-controlled diagnostic kits, adherence to manufacturer procedures, and repeat testing of selected samples.

10 Data Collection Procedure

Data collection was conducted over a period of four months. Trained research assistants visited selected communities and administered questionnaires to eligible participants.

Before questionnaire administration, the purpose of the study was explained, and informed consent was obtained. Following completion of the questionnaire, participants were directed to designated collection points where blood samples were obtained.

The collected data were reviewed daily for completeness before entry into the database.

11 Ethical Considerations

Ethical approval was obtained from the relevant institutional research ethics committee before commencement of the study.

Permission was also obtained from community leaders and local health authorities in the selected communities. Participation was voluntary, and written informed consent was obtained from all participants.

Confidentiality was maintained by assigning identification codes to questionnaires and laboratory samples. No personal information was disclosed outside the research team.

12 Data Analysis

Data were analysed using Statistical Package for Social Sciences (SPSS) version 27.

Descriptive statistics including frequencies, percentages, means, and standard deviations were used to summarise participants' characteristics and infection prevalence.

Associations between hepatitis infection status and possible risk factors were assessed using chi-square tests. Variables associated with infection at the bivariate level were further examined using logistic regression analysis.

Results were presented using tables and figures. Statistical significance was determined at a p-value of less than 0.05.

Results

1 Sociodemographic Characteristics of Participants

A total of 420 adults participated in the study. The mean age of participants was 36.8 ± 12.4 years. Most participants were within the 31–40 years age group.

Males represented 53.8% of participants, while females accounted for 46.2%. Farming was the most common occupation among respondents, reflecting the rural characteristics of the study locations.

Table 1: Sociodemographic Characteristics of Study Participants (n = 420)

Variable	Frequency	Percentage (%)
Sex		
Male	226	53.8
Female	194	46.2
Age group (years)		
18–30	124	29.5
31–40	138	32.9
41–50	96	22.9
Above 50	62	14.7
Occupation		
Farmer	186	44.3
Trader	84	20.0
Artisan	62	14.8
Civil servant	38	9.0
Others	50	11.9

Source: Researchers' field data (2025).

2 Prevalence of Hepatitis B and C Infection Among Participants

Among the 420 participants tested, 38 individuals were positive for hepatitis B surface antigen, giving an HBV prevalence of 9.0%.

Anti-HCV antibodies were detected among 14 participants, representing an HCV prevalence of 3.3%.

Seven participants tested positive for both HBV and HCV markers, representing a co-infection prevalence of 1.7%.

Table 2: Prevalence of Hepatitis B and C Infections Among Rural Residents

Infection status	Frequency	Percentage (%)
Hepatitis B positive	38	9.0
Hepatitis C positive	14	3.3
HBV/HCV co-infection	7	1.7
Negative for both infections	361	86.0

Source: Researchers' laboratory analysis (2025).

The findings showed that hepatitis B infection was more common than hepatitis C infection among the studied population.

3 Distribution of Hepatitis Infection by Study Location

Variation was observed in hepatitis prevalence across the selected communities.

Participants from Agatu Local Government Area recorded the highest HBV prevalence, while Kwande recorded the highest proportion of HCV infection.

Table 3: Distribution of Hepatitis Infection According to Study Location

Location	Number tested	HBV positive (%)	HCV positive (%)
Gwer East	140	11 (7.9)	4 (2.9)
Agatu	140	15 (10.7)	5 (3.6)
Kwande	140	12 (8.6)	5 (3.6)

Source: Researchers' laboratory analysis (2025).

4 Awareness and Preventive Practices Related to Viral Hepatitis

The assessment of hepatitis-related knowledge showed that 244 participants (58.1%) had heard about hepatitis B, while awareness of hepatitis C was lower, with 162 participants (38.6%) reporting previous knowledge.

Only 96 participants (22.9%) reported previous hepatitis testing, and 72 participants (17.1%) reported receiving hepatitis B vaccination.

Table 4: Awareness and Preventive Practices Among Participants

Indicator	Frequency	Percentage (%)
Heard about hepatitis B	244	58.1
Heard about hepatitis C	162	38.6
Previous hepatitis testing	96	22.9
Received hepatitis B vaccine	72	17.1

Source: Researchers' field data (2025).

5 Factors Associated with Hepatitis B and C Infection Among Participants

The relationship between selected exposure factors and hepatitis infection status was assessed among the study participants. Previous history of blood transfusion, traditional scarification practices, unsafe medical procedures, and limited hepatitis awareness were more frequently reported among participants who tested positive for HBV or HCV.

Participants who reported previous blood transfusion had a higher proportion of hepatitis infection compared with those without such history. Similarly, individuals who had undergone traditional skin-cutting practices showed increased occurrence of infection markers.

Table 5: Association Between Selected Risk Factors and Hepatitis Infection Status

Risk factor	Positive cases (%)	Negative cases (%)	p-value
Previous blood transfusion			
Yes	18 (22.5)	62 (77.5)	0.012
No	34 (10.0)	306 (90.0)	
Traditional scarification			

Yes	21 (18.4)	93 (81.6)	0.018
No	31 (10.1)	275 (89.9)	
Previous surgery/invasive procedure			
Yes	24 (14.8)	138 (85.2)	0.041
No	28 (10.9)	229 (89.1)	
Hepatitis awareness			
Poor awareness	41 (15.5)	224 (84.5)	0.009
Good awareness	11 (7.1)	144 (92.9)	

Source: Researchers' field and laboratory data (2025).

The analysis showed statistically significant associations between selected exposure factors and hepatitis infection status.

6 Predictors of Hepatitis Infection Among Rural Residents

Logistic regression analysis was conducted to identify independent predictors of hepatitis infection. Participants with a history of blood transfusion had increased odds of infection compared with those without previous transfusion history.

Traditional scarification practices and poor hepatitis awareness also remained significant predictors after adjustment for other variables.

Table 6: Logistic Regression Analysis of Factors Associated with Hepatitis Infection

Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Previous blood transfusion	2.41	1.21–4.80	0.013
Traditional scarification	2.18	1.10–4.31	0.025
Unsafe medical procedure	1.76	0.91–3.42	0.091
Poor hepatitis awareness	2.67	1.34–5.31	0.005

Source: Researchers' statistical analysis (2025).

The results indicated that previous exposure to blood-related procedures and inadequate knowledge of viral hepatitis were important factors associated with infection.

Discussion of Findings

This study assessed the epidemiology of hepatitis B and C infections among underserved rural populations in Benue State, Nigeria. The findings revealed that hepatitis B infection was more prevalent than hepatitis C infection among participants, with HBV prevalence of 9.0% and HCV prevalence of 3.3%.

The observed HBV prevalence reflects the continued burden of hepatitis B infection in Nigeria, where the virus remains endemic. Similar patterns have been reported in previous studies, with HBV consistently showing higher prevalence compared with HCV across several Nigerian population groups (Musa et al., 2015). The higher occurrence of HBV may be related to its greater efficiency of transmission, early childhood exposure, and the historical limitations of vaccination coverage.

The prevalence recorded in this study is comparable with findings from other community-based studies in Nigeria. Forbi et al. (2007) reported significant HBV circulation among Nigerian populations and emphasised the need for improved prevention strategies. Differences in prevalence across studies may be influenced by geographical location, study population, sample size, and variations in exposure patterns. The detection of HCV infection among rural residents, although lower than HBV, remains important because chronic HCV infection may progress silently for many years. Individuals with HCV infection may remain undiagnosed until complications such as liver fibrosis or cirrhosis develop. The limited availability of routine screening services in rural communities may contribute to delayed diagnosis.

The study found that previous blood transfusion was significantly associated with hepatitis infection. Although blood screening services have improved in Nigeria, previous transfusion exposure may remain an important risk factor, particularly among individuals who received transfusions before improvements in screening systems or in settings where screening practices were inconsistent. Traditional scarification practices were also associated with increased infection risk. Cultural practices involving skin cutting, tattooing, or the use of shared instruments may facilitate blood exposure when infection prevention measures are inadequate. Similar concerns have been documented in studies examining hepatitis transmission pathways in African populations.

The low level of hepatitis testing and vaccination reported among participants highlights important gaps in prevention services. Only 22.9% of participants had previously undergone hepatitis testing, while fewer than one-fifth reported receiving hepatitis B vaccination. This finding suggests that

many rural residents may remain unaware of their infection status and may not benefit from available preventive interventions.

Limited awareness of hepatitis B and C was another important finding. Participants with poor knowledge had higher odds of infection compared with those with better awareness. This supports the role of health education in improving prevention behaviours. Awareness programmes that explain transmission routes, vaccination benefits, and the importance of early testing may improve community participation in hepatitis control activities.

The findings also align with broader public health observations that social and healthcare inequalities influence infectious disease outcomes in underserved populations. Ugbede and colleagues have highlighted the importance of addressing community-level barriers, healthcare access challenges, and preventive health practices in reducing disease risks among vulnerable populations. These factors are particularly relevant in rural hepatitis control, where prevention depends not only on medical interventions but also on improving access to information and healthcare services. The study supports the need for a stronger community-based approach to hepatitis prevention in Benue State. Screening programmes integrated into primary healthcare services, improved vaccination coverage, and targeted health education could help identify infections earlier and reduce future transmission.

However, the study had some limitations. The cross-sectional design limited the ability to determine the exact timing of infection acquisition. In addition, some behavioural information was self-reported and may have been affected by recall or reporting bias. Despite these limitations, the study provides useful evidence on hepatitis burden among underserved rural communities in Benue State.

Conclusion

This study demonstrated that hepatitis B and C infections remain present among underserved rural populations in Benue State, Nigeria. Hepatitis B infection was more prevalent than hepatitis C infection among the studied communities.

The study identified important factors associated with infection, including previous blood transfusion, traditional scarification practices, and inadequate awareness of viral hepatitis. Low levels of hepatitis testing and vaccination coverage indicate gaps in current prevention efforts.

The objectives of the study were achieved by determining the prevalence of HBV and HCV infections, identifying associated risk factors, and assessing preventive practices among rural residents. Strengthening community-based screening, vaccination, and health education programmes is necessary to reduce the burden of viral hepatitis in rural Nigeria.

Recommendations

Based on the findings, the following recommendations are proposed:

1. Expand rural hepatitis screening programmes
2. Primary healthcare facilities in rural communities should incorporate routine hepatitis B and C screening, particularly for individuals with known exposure risks.
3. Improve hepatitis B vaccination coverage
4. Health authorities should strengthen adult and childhood hepatitis B vaccination programmes, especially in communities with limited healthcare access.
5. Increase community health education
6. Health education campaigns should be organised to improve understanding of hepatitis transmission, prevention, and available treatment options.
7. Strengthen blood safety practices
8. Healthcare facilities should maintain strict adherence to blood screening procedures to minimise transfusion-related transmission.
9. Address unsafe traditional practices
10. Community leaders and health workers should collaborate to promote safer practices and discourage the use of unsterile instruments for procedures involving skin penetration.
11. Improve access to rural healthcare services
12. Government and healthcare partners should strengthen primary healthcare infrastructure to support early diagnosis, referral, and treatment of hepatitis cases.

Conflict of Interest Statement

The authors declare that there is no conflict of interest associated with this study. No personal, financial, or institutional relationship influenced the design, data collection, analysis, interpretation, or reporting of the findings.

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