African Scientist Vol. 26, No. 1 March 31, 2025
Printed in Nigeria

1595-6881/2025 $80.00 + 0.00

https://africansciientistjournal.org

AFS2025010/26111

Investigating Hepatitis B Co-Infection in COVID-19 Patients in a National Teaching Hospital in Southern Nigeria

Ifueko Mercy Moses-Otutu[1*] Osayande Odaro[1] and Isaac Ohiorenuan Igbarumah[1,2]

[1]Department of Medical Laboratory Science, School of Basic Medical Sciences, University of Benin, P.M.B. 1154, Benin City, Nigeria.
[2]Molecular Laboratory, University of Benin Teaching Hospital, Benin City, Edo State, Nigeria.

*Corresponding author email: ifueko.moses-otutu@uniben.edu; Tel: +234 (0) 803 686 8229

(Received March 2, 2025; Accepted in revised form March 21, 2025)

ABSTRACT: Hepatitis B virus (HBV) remains a significant global health issue, particularly in regions with high endemicity. With the advent of the COVID-19 pandemic, understanding the intersection of HBV infection and COVID-19 is crucial. This study investigated the prevalence and impact of pre-existing HBV infection among COVID-19 patients in Benin City, Edo State, Nigeria. This single-center cross-sectional study was conducted at the University of Benin Teaching Hospital. A total of 150 confirmed COVID-19 positive patients (84 males and 66 females) were enrolled, alongside 50 non-COVID-19 healthy individuals as controls. Blood samples were collected and analyzed using Abnova® HBV Test Kits and confirmed by ELISA assay. The prevalence of HBV among COVID-19 patients was 8%. Males demonstrated a higher infection rate (58.33%) compared to females (41.67%). Age distribution analysis revealed that individuals aged 21–40 years had the highest frequency of HBV infection. Seasonal variation data indicated greater prevalence during the rainy season (75%) compared to the dry season (25%). The study indicates that while HBV co-infection exists among COVID-19 patients, its impact on clinical outcomes may vary. Enhanced monitoring and targeted management are essential for co-infected patients. Continued research is needed to further explore the complex interactions between HBV and COVID-19.

Keywords: Hepatitis B, COVID-19, Co-infection, Public health

Introduction

Hepatitis B virus (HBV) continues to be a significant global health issue, particularly in regions with high endemicity such as sub-Saharan Africa. As a DNA virus belonging to the *Hepadnaviridae* family, HBV is a leading cause of chronic liver diseases, including cirrhosis and hepatocellular carcinoma, contributing heavily to global morbidity and mortality (WHO, 2020). According to the World Health Organization (WHO), approximately 257 million people globally are living with chronic HBV infection, leading to nearly 900,000 deaths annually due to complications like liver failure and cancer (Shepard *et al*., 2006). In Nigeria, the prevalence of HBV remains high, with studies showing rates that range from 8% to over 12% in various regions (Adoga *et al.*, 2010).

The COVID-19 pandemic, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has presented multifaceted challenges to healthcare systems worldwide. In addition to respiratory complications, COVID-19 has been associated with multi-organ effects, including significant liver dysfunction (Adoga *et al.*, 2010; Chen *et al*., 2020). This has raised questions regarding how pre-existing liver diseases, such as chronic HBV, may influence the clinical course and outcomes of COVID-19 infection. While some reports suggest that liver impairment in COVID-19 patients may be exacerbated by underlying conditions, the interaction between HBV and SARS-CoV-2 remains under-explored, with studies showing varied impacts on severity and clinical prognosis (He *et al.*, 2021; Kang *et al*., 2021).

Given the endemic nature of HBV in Nigeria and the prevalence of COVID-19, understanding the intersection of these two viral infections is crucial for developing appropriate management strategies. Local data is essential to determine specific regional characteristics and guide public health responses. This study therefore aims to investigate the occurrence and characteristics of hepatitis B infection in COVID-19 patients in Benin City, Edo State, and assess its implications on clinical outcomes. By analyzing HBV prevalence and its association with COVID-19, the study seeks to provide insights that could influence clinical practice and healthcare policy in regions facing high burdens of both infections.

Materials and methods

Study design: This study was designed as a single-center, cross-sectional investigation conducted at the University of Benin Teaching Hospital (UBTH), located in Benin City, Edo State, Nigeria. The research was carried out from January to June 2022 and aimed to evaluate the prevalence of HBV infection among patients diagnosed with COVID-19.
Study population: The study involved 150 COVID-19-positive patients (84 males and 66 females) who were recently diagnosed at UBTH. Additionally, 50 non-COVID-19 healthy individuals were included as controls to provide comparative baseline data.
Inclusion and exclusion criteria: Inclusion criteria encompassed individuals who tested positive for COVID-19 within the study period and were willing to participate. Exclusion criteria were set to omit individuals who tested negative for COVID-19 or declined to participate.
Sample collection: Blood samples were collected via venipuncture using sterile disposable syringes and needles. Up to 4 mL of blood were drawn from each participant and transferred into plain, sterile bottles. The samples were then centrifuged at 3000 rpm for 10 min to separate the serum, which was subsequently stored at temperatures below -20 °C until analysis.
Specimen processing and analysis: Serum samples were processed in the Molecular Laboratory at the University of Benin Teaching Hospital (UBTH). Before testing, the frozen sera were thawed at room temperature for 45 min. The samples were then screened for hepatitis B surface antigen (HBsAg) using Abnova® HBV Test Kits, following the manufacturer's protocol. The HBsAg positive samples were further confirmed using ELISA assay in the Molecular Diagnostic and Virology Laboratory, a department in the Medical Microbiology Laboratory, University of Benin Teaching Hospital, Benin City, Edo State, Nigeria. The reagents were brought to room temperature (37 °C). The thawed sera were mixed homogenously and antibodies against HBV were screened using a commercially available Enzyme Linked Immunosorbent Assay (ELISA) test kit (manufactured by Sunlong Biotech Laboratories). The plates were read at a wavelength of 450nm using a spectrophotometer. The results were then interpreted according to the manufacturer's instructions. A negative reaction indicated the absence of significant HBsAg IgM antibodies while a positive reaction indicated either an acute or a current infection. The assay had controls and standards to ensure accuracy.
Quality control: The quality control tags of the ELISA kits were checked before analysis to ensure it was intact before purchase. While, after purchase and before use, the kits were stored at the manufacturer's recommended temperature (2-27 °C). The ELISA kits were used following the manufacturer's instructions. All the acquired data were checked for data precision throughout the process of analysis.
Data collection and statistical analysis: Demographic and clinical data were extracted from participant records and included in the analysis. Statistical evaluation was conducted using the Statistical Package for the Social Sciences (SPSS), with chi-square tests applied to determine the significance of relationships between variables. A p-value of <0.05 was considered statistically significant.
Ethical considerations: Ethical approval for the study was obtained from the Ethics and Research Committee of the University of Benin Teaching Hospital (Approval no-ADM/E 22/A/VOL VII/14831240). Informed consents were obtained from the participants before sample collection. Adequate explanations of the possible risks that might be involved were also explained to the participants before sample collection ensuring anonymity and adherence to ethical standards.

Results

A total of 200 participants were recruited for the study, comprising 150 COVID-19-positive patients and 50 non-COVID-19 healthy individuals who served as controls. The findings from this study on the occurrence and characteristics of hepatitis B infection among COVID-19 patients in Benin City, Edo State, revealed an 8% rate

of HBV co-infection among the COVID-19-positive cohort (Table 1). Males exhibited a higher prevalence (58.33%) compared to females (41.67%), indicating potential gender-related vulnerability or exposure factors (Table 2). The age distribution analysis showed that the 21–40 years age group had the highest number of cases, suggesting that individuals within this demographic may be more prone to HBV co-infection when exposed to COVID-19 (Table 2). Additionally, seasonal data indicated that the prevalence of HBV was more pronounced during the rainy season (75%) compared to the dry season (25%) (Table 2). Additionally, 80% of participants were aware of HBV and its screening, while 20% had no prior knowledge, revealing a gap in awareness that necessitates targeted educational campaigns (Table 3). Furthermore, these findings emphasise the need for gender-specific and age-focused public health strategies, enhanced HBV screening integrated into COVID-19 care protocols, and seasonally adapted healthcare planning. Raising awareness and promoting education on HBV prevention and screening are crucial to improving early detection and treatment outcomes, ensuring comprehensive responses to co-infection risks in high-burden areas.

Table 1: HBV infection among COVID-19 positive patients in Edo State, Nigeria

Variable	No. Examined	Prevalence	Percentage	*p*-value	Odds ratio	95% CI
Positive	150	12	08	<0.0001	0.008	0.003-0.018
Negative	150	138	92			
Total		150	100			

Table 2: HBV infection among COVID-19 positive patients by gender

Variable	No. Examined (%)	No. positive	Percentage positive	*p*-value	OR	95% CI
Gender						
Males	84 (56)	07	58.33	0.865	1.109	0.3614-3.242
Females	66 (44)	05	41.67			
Total	150(100)	12	100			
Age (Years)						
<20	10 (6.67)	00	00	0.181		
21-40	91 (60.67)	10	83.33			
41-60	31 (20.67)	00	00.00			
61-70	14 (9.33)	01	8.33			
>70	04 (2.67)	01	8.33			
Total	150 (100)	12	100			
Season						
Rainy	90	09	75			
Dry	60	03	25			

Table 3: Knowledge, attitude, and practice (KAP) of HBV among COVID-19 patients

Variable	Frequency	Percentage
Ever Heard	120	80
Never Heard	30	20
Total	150	100

Discussion

The results of this study, which investigated the occurrence and characteristics of hepatitis B infection among COVID-19 patients in Benin City, Edo State, reveal several important insights. The 8% prevalence rate of HBV among COVID-19 positive patients aligns with existing data on HBV endemicity in Nigeria, which underscores the significant public health burden posed by chronic hepatitis (Jatau and Yabaya, 2009). This prevalence is consistent with findings from other studies in sub-Saharan Africa, where co-infection rates between HBV and COVID-19 have shown variability depending on demographic and geographical factors (Moon *et al.*, 2020).

Gender distribution analysis indicated that males exhibited a higher prevalence of HBV co-infection (58.33%) compared to females (41.67%). This finding corroborates previous research suggesting that males may be at higher risk for HBV infection due to behavioral and exposure factors such as occupational hazards and lifestyle choices that increase vulnerability (Drosten *et al.*, 2004). Furthermore, it has been observed that males with chronic HBV infection may experience more pronounced liver function impairment during concurrent viral infections, which could explain their higher representation in the co-infected group (Lok and McMahon, 2007).

The age distribution of HBV infection among COVID-19 patients showed the highest prevalence in the 21–40 years age group. This demographic is often considered highly active in terms of social and occupational interactions, which may contribute to their increased exposure risk (Gupta *et al.*, 2020). Previous studies have suggested that younger adults are more likely to present with asymptomatic or mild HBV infections, potentially contributing to underreporting and underdiagnosis until co-infections such as COVID-19 reveal underlying chronic conditions (Lau, 2005). This finding underscores the importance of targeted public health interventions aimed at increasing HBV awareness and screening within this age group.

Seasonal variation data indicated a higher prevalence of HBV co-infection during the rainy season (75%) compared to the dry season (25%). This trend may be influenced by seasonal health-seeking behaviour, as rainy periods are associated with increased attendance at healthcare facilities due to higher incidences of infectious diseases (Lipsitch *et al.*, 2020). Environmental factors and their impact on viral transmission dynamics could also play a role, as changes in humidity and temperature may affect the viability and spread of HBV and other pathogens (Singh *et al.*, 2020).

It is notable that, while HBV co-infection exists among COVID-19 patients, the interaction between these two infections and their cumulative effect on clinical outcomes is complex. Some studies indicate that patients with chronic liver conditions, including HBV, may be at risk for more severe COVID-19 outcomes due to compromised liver function and altered immune responses (Suslov *et al.*, 2021). However, other research highlights that the chronic nature of HBV infection might modulate the immune system in a way that could mitigate the inflammatory cytokine storm often seen in severe COVID-19 cases (Yu *et al.*, 2021). This duality points to the need for further investigation to fully understand the mechanisms involved in HBV and SARS-CoV-2 co-infection.

The higher prevalence of co-infection in males and younger adults, as seen in this study, signals the importance of targeted educational campaigns and preventive measures to curb the spread of HBV and manage its impact on COVID-19 outcomes. Additionally, the seasonally influenced health-seeking behaviors highlight a potential avenue for strategic public health planning, where resources and screening efforts could be increased during periods of higher disease prevalence to maximize reach and efficacy.

Overall, this study contributes valuable regional data to the broader understanding of HBV and COVID-19 interactions. These findings support the continued integration of liver function monitoring and HBV screening in COVID-19 treatment protocols, particularly in endemic areas. Public health policies should advocate for regular HBV screening and vaccination programs, especially for high-risk demographics, to reduce the burden of co-infections and improve patient outcomes (Confalonieri *et al.*, 2005; Anugwom *et al.*, 2021). Further longitudinal and multicentric studies are recommended to establish a comprehensive understanding of the long-term impacts of HBV and COVID-19 co-infection and inform future clinical guidelines.

Conclusion

This study provides critical insights into the occurrence and characteristics of hepatitis B infection among COVID-19 patients in Benin City, Edo State. It highlights an 8% prevalence of hepatitis B (HBV) co-infection among COVID-19 patients in Benin City, with higher rates in males and individuals aged 21–40 years. Seasonal variation showed increased prevalence during the rainy season. While HBV co-infection poses potential risks for liver function impairment, the exact impact on COVID-19 outcomes remains complex. However, the findings emphasise the need for targeted HBV screening, vaccination, and integrated liver monitoring in COVID-19 care protocols. Enhanced public health measures and further research are essential to fully understand and manage the interplay between HBV and COVID-19 effectively.

Conflict of Interest

None

Acknowledgment

We wish to specifically thank the laboratory staff of the Molecular Laboratory at the University of Benin Teaching Hospital for their assistance in sample collection and laboratory analysis.

References

Adoga MP, Gyar SD, Pechulano S, Bashayi OD, Emiasegen SE, Zungwe T, Iperepolu OH, Agupugo C, Agwale SM: Hepatitis B virus infections in apparently healthy urban Nigerians: data from pre-vaccination tests. J Infect Dev Ctries, 4(6):397–400. 2010.

Alqahtani SA, Schattenberg JM: Liver injury in COVID-19: The current evidence. United European Gastroenterol J, 8(5):509–19. 2020.

Anugwom CM, Aby ES, Debes JD: Inverse association between chronic hepatitis B infection and coronavirus disease 2019 (COVID-19): Immune exhaustion or coincidence? Clin Infect Dis, 72(1):180–2. 2021.

Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, Qiu Y, Wang J, Liu Y, Wei Y, Xia J, Yu T, Zhang X, Zang L : Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet, 395(10223):507–13. 2020.

Confalonieri M, Urbino R, Potena A: Hydrocortisone infusion for severe community-acquired pneumonia: a preliminary randomized study. Am J Respir Crit Care Med, 171(3):242–8. 2005.

Drosten C, Nippraschk T, Manegold C, Meisel H, Brixner V, Roth WK, Apedjinou A, Gunther S: Prevalence of hepatitis B virus DNA in anti-HBc-positive/HBsAg-negative sera correlates with HCV but not HIV serostatus. J Clin Virol, 29(1):59–68. 2004.

Gupta N, Desalegn H, Ocama P: Converging pandemics: implications of COVID-19 for the viral hepatitis response in sub-Saharan Africa. Lancet Gastroenterol Hepatol, 5(7):634–6. 2020.

He Q, Zhang G, Gu Y: Clinical characteristics of COVID-19 patients with pre-existing hepatitis B virus infection: A multicenter report. Am J Gastroenterol, 116(2):420–1. 2021.

Jatau ED, Yabaya A: Seroprevalence of hepatitis B virus in pregnant women attending a clinic in Zaria, Nigeria. Sci World J, 4(4):7–9. 2009.

Kang SH, Cho DH, Choi J, Balk SK, Gwon JG, Kim MY: Association between chronic hepatitis B infection and COVID-19 outcomes: A Korean nationwide cohort study. PLoS One, 16(10): e0258229. 2021.

Lau GKK: Hepatitis B infection in the era of severe acute respiratory syndrome. Clin Microbiol Infect, 11(2):101–5. 2005.

Lipsitch M, Swerdlow DL, Finelli L: Defining the epidemiology of COVID-19 - Studies needed. N Engl J Med, 382(13):1194–6. 2020.

Lok AS, McMahon BJ: Chronic hepatitis B. Hepatology, 45(2):507–39. 2007.

Moon AM, Webb GJ, Aloman C, Armstrong MJ, Cargill T, Dhanasekaran R, Genesca J, Gill US, James TW, Jones PD, Marshal A, Mells G, Perumalswami PV, Qi S, Su F, Ufere NN, Barnes E, Barritt AS, Marjot T: High mortality rates for SARS-CoV-2 infection in patients with pre-existing chronic liver disease and cirrhosis: Preliminary results from an international registry. J Hepatol, 73(3):705–8. 2020.

Shepard CW, Simard EP, Finelli L, Fiore AE, Bell BP: Hepatitis B virus infection: epidemiology and vaccination. Epidemiol Rev, 28(1):112–25. 2006.

Singh AK, Gillies CL, Singh R, Singh A, Chudasama Y, Coles B, Seidu S, Zaccardi F, Davies MJ, Khunti K: Prevalence of co-morbidities and their association with mortality in patients with COVID-19: A systematic review and meta-analysis. Diabetes Obes Metab, 22(10):1915–24. 2020.

Suslov A, Meier MA, Ketterer T, Wang X, Bohlen S, Nuciforo S, Wieland S, Heim MH: Chronic hepatitis B virus infection does not significantly impact the outcome of SARS-CoV-2 infection. Gut, 70(4):687–95. 2021.

World Health Organization (WHO). Hepatitis B. [Internet]. 2024. Available from: https://www.who.int/news-room/fact-sheets/detail/hepatitis-b

Yu ML, Yeh ML, Tsai PC, Huang CF, Hsieh MH, Huang JF, Gwong JG, Xia J: severe acute respiratory syndrome coronavirus 2 infection in patients with chronic hepatitis B. J Viral Hepat, 28(1):89–92. 2021.