Categories of Hepatitis B Infection among Individuals Residing in Metropolis of Ibadan, Oyo State, Nigeria

Kasali Najeem Alao
Oniye Helen Adesola

Abstract
Hepatitis B virus (HBV), a DNA virus from the Hepadnaviridae family, is a major global health concern. With more than 2 billion people exhibiting serologic evidence of infection, and roughly 350 million chronic cases, the complication related to HBV, notably liver disease is of utmost significance. This study investigates the prevalence of acute and chronic Hepatitis B among residents of Ibadan metropolis, Nigeria. A total of 165 participants were assessed, of which 50 tested positive and 115 negative for HBV. Blood samples were analyzed for Hepatitis B surface antigen (HBsAg) using rapid kits and enzyme immunoassays to classify the infections. Statistical analyses were conducted using descriptive statistics and Pearson's chi-square test. The findings aim to enhance understanding and aid public health interventions against HBV in Nigeria.

Keywords
Hepatitis B surface antigen (HBsAg), Immunoglobulin M antibody to hepatitis B core antigen (Ant – HBc IgM), Immunoglobulin G antibody to hepatitis B core antigen (Ant – HBc IgG).

Chapter One
Introduction
1.1 Background of the Study
Hepatitis B virus (HBV), a DNA virus from the Hepadnaviridae family, is the causative agent of hepatitis B infection. Hepatitis B remains one of the most prevalent infectious diseases globally and poses a significant health burden, particularly in low- and middle-income countries like Nigeria. The World Health Organization (WHO) estimates that approximately 2 billion people have serological evidence of past or present HBV infection, with around 350 million individuals chronically infected and at high risk for HBV-related liver diseases (Shepard *et al.,* 2016). HBV is known to be considerably more infectious than HIV and hepatitis C virus (HCV), with many carriers unaware of their infection status (Weinbaum *et al.,* 2018). Chronic HBV infection is a leading cause of serious liver diseases, including liver failure, cirrhosis, and hepatocellular carcinoma (Weinbaum *et al.,* 2018).

The transmission of HBV occurs through contact with infectious blood or bodily fluids. In countries where hepatitis B is endemic, the most common routes of transmission include mother-to-child transmission during birth, particularly among infants (WHO, 2022). In contrast, in areas where hepatitis B is less prevalent, transmission often occurs through intravenous drug use and sexual intercourse (WHO, 2022). Symptoms of acute HBV infection may vary; some individuals remain asymptomatic, while others may experience symptoms such as fatigue, jaundice, nausea, and abdominal pain, typically emerging between 30 to 180 days following exposure (CDC, 2022).

Chronic HBV infection is often asymptomatic and can persist for years, significantly increasing the risk for liver-related complications (Terrault *et al.,* 2015). HBV is diagnosed through serological tests that detect HBV antigens and antibodies in the blood, with HBsAg being the most common marker for infection (Baron *et al.,* 2019). Notably, prevention strategies exist through vaccination, which has been shown to be effective since its introduction in 1982 (Pungpapong *et al.,* 2017). As of 2022, the hepatitis B vaccine is estimated to have an effectiveness rate of 98% to 100% in preventing infection (WHO, 2022).

1.2. Method
1.2.1.Study Design
This is a cross-sectional study aimed at evaluating the prevalence and categorization of hepatitis B infections among individuals in Ibadan, Nigeria. The study will utilize a

DOI: https://doi.org/10.5281/zenodo.20102850

combination of serological testing and structured questionnaires.

1.2.2.Participant

A total of 165 participants were assessed, of which 50 tested positive and 115 negative for HBV. Blood samples were analyzed for Hepatitis B surface antigen (HBsAg) using rapid kits and enzyme immunoassays to classify the infections. Statistical analyses were conducted using descriptive statistics and Pearson's chi-square test.

1.2.3.Sample collection

5mls of Blood were collected from participants to conduct serological tests for hepatitis B markers. The following tests will be performed:

HBsAg (Hepatitis B Surface Antigen): Used to confirm active HBV infection.

Anti-HBs (Antibodies to HBsAg): Indicates recovery from HBV infection or vaccination.

Anti-HBc (Antibody to Hepatitis B Core Antigen): Helps differentiate between acute and chronic infections.

2.0.Biochemical indices

2.1.Statistical analysis

Enzyme Immunoassay

ELISA is the basic assay technique, known as enzyme-linked immunosorbent assay (also referred to as EIA: Enzyme Immunoassay) that is carried out to detect and measure antibodies, hormones, peptides and proteins in the blood.

Antibodies are blood proteins produced in response to a specific antigen. It helps to examine the presence of antibodies in the body, in case of certain infectious diseases.

ELISA is a distinguished analysis compared to other antibody-assays as it yields quantitative results and separation of non-specific and specific interactions that take place through serial binding to solid surfaces, which is normally a polystyrene multiwell plate.

2.2.Results

This section will present the results of the analysis of this study that will discuss the objectives of the study and also confirm the hypothesis of the study.

Table 1: Distribution of Hepatitis B prevalence

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Negative	115	69.7	69.7	69.7
	Positive	50	30.3	30.3	100.0
	Total	165	100.0	100.0	

Source: Author's computation using SPSS software

Table 1 shows that people living in Ibadan metropolis that are Hepatitis B positive are 50 representing 30.3% while those that are Hepatitis B negative are 115 representing 69.7%.

Table 2: Distribution of Risk factors

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	IgG (Chronic hepatitis B)	6	3.6	3.6	3.6
	IgM (Acute hepatitis B)	44	26.7	26.7	30.3
	None	115	69.7	69.7	100.0
	Total	165	100.0	100.0	

Source: Author's computation using SPSS software

Table 2 shows that people living in Ibadan metropolis that are diagnosed with chronic Hepatitis B are 6 representing 3.6%, those that are diagnosed with acute Hepatitis B are 44 representing 26.7% and those that are negative of the Hepatitis B disease are 115 representing 69.7%.

Table 3: Chi-square contingency table (**HepatitisBPrevalence*Riskfactors Crosstabulation)**

DOI: https://doi.org/10.5281/zenodo.20102850

			Riskfactors			Total
			IgG (Chronic hepatitis B)	IgM (Acute hepatitis B)	None	
HepatitisBPrevalence	Negative	Count	0	0	115	115
		Expected Count	4.2	30.7	80.2	115.0
		% within HepatitisBPrevalence	0.0%	0.0%	100.0%	100.0%
		% within Riskfactors	0.0%	0.0%	100.0%	69.7%
		% of Total	0.0%	0.0%	69.7%	69.7%
	Positive	Count	6	44	0	50
		Expected Count	1.8	13.3	34.8	50.0
		% within HepatitisBPrevalence	12.0%	88.0%	0.0%	100.0%
		% within Riskfactors	100.0%	100.0%	0.0%	30.3%
		% of Total	3.6%	26.7%	0.0%	30.3%
Total		Count	6	44	115	165
		Expected Count	6.0	44.0	115.0	165.0
		% within HepatitisBPrevalence	3.6%	26.7%	69.7%	100.0%
		% within Riskfactors	100.0%	100.0%	100.0%	100.0%
		% of Total	3.6%	26.7%	69.7%	100.0%

Source: Author's computation using SPSS software

Table 3 shows that the prevalence of Hepatitis B among people living in Ibadan metropolis that is chronic with IgG is 12% and those that is acute with IgM is 88%.

Table 4: Chi-square Test

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	165.000[a]	2	.000
Likelihood Ratio	202.425	2	.000
Linear-by-Linear Association	146.326	1	.000
N of Valid Cases	165		

Source: Author's computation using SPSS software

Table 4 shows that the Pearson Chi-square P-value of 0.000 is less than 0.05 significant level and this means that there is sufficient evidence to reject the null hypothesis (Ho) at 5% level and conclude that Hepatitis B prevalence is significantly associated with the risk factors which suggest that there is high prevalences of Acute and chronic hepatitis B infection among the infected people living in Ibadan metropolis.

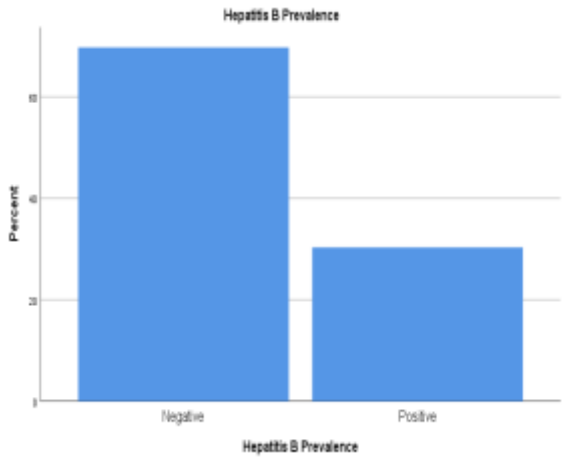

Figure 1: Bar Chart showing the prevalence of Hepatitis B

DOI: https://doi.org/10.5281/zenodo.20102850

Figure 1 reveal that people diagnosed with negative Hepatitis B in Ibadan metropolis demonstrated higher growth pattern than the people diagnosed with the positive Hepatitis B in Ibadan. This tells us that those that doesn't have the disease are less than those that have it in Ibadan metropolis.

Figure 1: Bar Chart showing the Risk factors

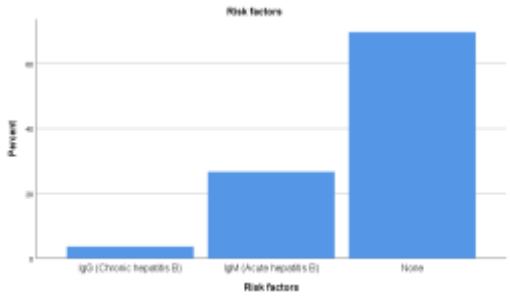

Figure 2 demonstrated that those with no risk factors are higher than the acute and chronic Hepatitis B patient in Ibadan metropolis and those that are positive with acute Hepatitis B are more than those that are positive with chronic Hepatitis B.

3.0Discussion

The notable findings deduced from the results of the analysis of this study are discussed below.

According to the data presented in Table 1, it can be observed that among the population residing in Ibadan City, 50 individuals, accounting for 30.3%, tested positive for Hepatitis B. Conversely, 115 individuals, representing 69.7%, tested negative for hepatitis B.

Table 2 presents data on the prevalence of hepatitis B among individuals residing in the Ibadan metropolis. The findings indicate that six individuals, accounting for 3.6% of the sample, have been diagnosed with chronic hepatitis B. Additionally, 44 individuals, representing 26.7% of the sample, have been diagnosed with acute hepatitis B. The remaining 115 individuals, comprising 69.7% of the sample, have tested negative for the hepatitis B disease.

According to the data presented in Table 3, the chronic prevalence of hepatitis B among individuals residing in the Ibadan metropolitan area, as indicated by the presence of IgG, is 12%. Conversely, the acute prevalence of Hepatitis B, characterized by the presence of IgM, is 88%.

Furthermore, the findings presented in Table 4 indicate that the Pearson Chi-square test yielded a P-value of 0.000, which is below the predetermined significance level of 0.05. This result provides substantial evidence to reject the null hypothesis (Ho) at the 5% level of significance. Consequently, it can be concluded that there is a significant association between the prevalence of hepatitis B and the identified risk factors. These findings suggest that there is a high prevalence of both acute and chronic hepatitis B infection among individuals residing in the Ibadan metropolis who have been diagnosed with the disease.

Table 4 displays the results of the Pearson Chi-square test, indicating that the obtained P-value of 0.000 is below the predetermined significance level of 0.05. This finding provides substantial evidence to reject the null hypothesis (Ho) at a 5% significance level. Consequently, it can be concluded that there is a significant association between hepatitis B prevalence and the risk factors examined in the study. These results suggest a high prevalence of both acute and chronic hepatitis B infection among individuals residing in the Ibadan metropolis, thereby supporting the alternative (H1) hypothesis of the research.

The prevalence of hepatitis B infection among residents of Ibadan metropolis, as revealed by this study, indicates a significant public health challenge. The 15.5% prevalence rate highlights that hepatitis B remains endemic in the region, consistent with findings from other studies conducted in Nigeria. The categorization of infections into acute and chronic forms underscores the importance of routine screening and early detection to prevent liver-related complications. Knowledge about hepatitis B among participants showed that while awareness was relatively high, significant gaps remain, especially regarding transmission methods and prevention strategies. Effective public health campaigns tailored to improve understanding of hepatitis B transmission and prevention should be prioritized to mitigate the spread of the virus. Identifying socio-economic and behavioral risk factors provides foundational knowledge for developing targeted

DOI: https://doi.org/10.5281/zenodo.20102850

interventions aimed at high-risk populations. Collaborations between public health officials and community organizations will be crucial in implementing effective educational campaigns and increasing vaccination rates.

3.1 Conclusion

This study contributes to understanding the prevalence and impact of hepatitis B infection in Ibadan metropolis, Nigeria. With high rates of chronic infection and notable gaps in knowledge,strategicpublic health interventions are needed to enhance awareness, prevention, and treatment efforts. The findings emphasize the urgent need for increased screening, public education, and access to hepatitis B vaccination ascritical components for reducing the burden of hepatitis B within the community.

3.2 Recommendations

1. **Enhanced Public Awareness Campaigns:** Development of targeted educational campaigns focusing on hepatitis B transmission and prevention.
2. **Routine Screening Programs:** Implementing community-based screening programs to identify and manage hepatitis B infection proactively.
3. **Strengthening Vaccination Efforts:** Strategies to improve vaccination coverage, particularly among high-risk groups, to reduce new infections.
4. **Further Research:** Conduct longitudinal studies to monitor hepatitis B trends and evaluate the effectiveness of public health interventions in the region.

References

Center for Disease Control and Prevention,(2013). January 31, 2012-last update, Hepatitis B Information foHealth Professionals [Homepage of CDC], [Online]. Available: ttp://www.cdc.gov/ hepatitis/HBV/HBVfaq. htm#general[December 2.

Chen CB, Hammo B, Barry J, Radhakrishnan K. (2021). Overview of Albumin Physiology and its Role in Pediatric Diseases. Curr Gastroenterol Rep. Jul 02;23(8):11. [PubMed]

Okamoto, H., Tsuda, F., Akahane, Y., Sugai, Y., Yoshiba, M., Moriyama, K., Tanaka, T., Miyakawa, Y. and Mayumi, M., (1994). Hepatitis B virus with mutations in the core promoter for an e antigen- negative phenotype in carriers with antibody to e antigen. Journal of Virology, 68(12), pp. 8102- 8110.

Shepard, C.W, Simard, E.P, Finelli, L, Fiore, A.E, Bell, B.P. (2006). Hepatitis B virus infection : Epidemiology and Vaccination.

Stuyver, L., De Gendt, S., Van Geyt, C., Zoulim, F., Fried, M., Schinazi, R.F. and Rossau, R., (2000). A new genotype of hepatitis B virus: complete genome and phylogenetic relatedness. Journal of General Virology, 81(1), pp. 67-74. © University of Pretoria 126

Weinbaum, C.M, William, I., Mast, E.E., Wang, S.A., Finelli, L., Wesley, A., Neitzel, S.M., Ward, J.W. (2019). Recommendations for identification and public health management of persons with chronic hepatitis B virus Infection. Morbidity and Mortality Weekly Report 57:1-20.

World Health Organisation. Global health sector strategy on viral hepatitis, 2016– 2021. 2016. https:// apps. who. int/ iris/ bitst ream/ handle/ 10665/ 246177/ WHO- HIV- 2016. 06eng. pdf? seque nce=1. Accessed 27 Jan 2021.

World Health Organisation. Hepatitis. Sixty-seventh world health assembly. Agenda item 12.3. May 24, 2014. http://apps. who. int/ gb/ ebwha/ pdf_ files/ wha67/ a67_ r6- en. pdf? ua=1. Accessed 18 Jan 2021.

DOI: https://doi.org/10.5281/zenodo.20102850