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Research Article

Retrospective Prevalence of Hepatitis B Virus (HBV) and its Associated Risk Factors in Maiduguri, Northeastern Nigeria: A Hospital-Based Study

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ABSTRACT

Hepatitis B virus (HBV) is a significant global health issue, affecting approximately 350 million chronic carriers worldwide. A retrospective study on HBV was conducted at the Maiduguri State Specialist Hospital from 2017 to 2023, utilising laboratory records to evaluate the prevalence of HBV among patients. The analysis, performed using SPSS version 23.0, examined 81,469 patient records. Latex agglutination assays were employed to test for the presence of HBV surface antigen (HBsAg). The overall prevalence of HBV was found to be 3.89% (3,171 out of 81,469), with the highest prevalence occurring in 2018 at 5.01%. The infection rates were notably higher among females (57.2%) compared to males (42.8%). Additionally, the prevalence was slightly elevated during the dry season (3.91%) in contrast to the wet season (3.88%). There was significant ($p<0.05$) association between age, years and HBV prevalence. HBV is endemic in Maiduguri, exhibiting variations based on sex and seasonal factors. The study recommends enhanced vaccination and screening efforts.

Keywords: Hepatitis-B Virus; Maiduguri; Prevalence; Retrospective; Risk factors

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INTRODUCTION

Hepatitis B virus (HBV) is a major global health threat, caused by a double-stranded DNA virus belonging to the family Hepadnaviridae, with a genome size of 3.2Kb (Li *et al*. 2024). It is transmitted vertically from mother to child during delivery and horizontally through abraded skin, unprotected sex (coitus), and blood transfusion (Li *et al.* 2024). However, HBV infection, if left unmanaged, can lead to liver disease (Wright, 2006). Lack of awareness of HBV among people may hinder disease control efforts and also play a role in disease spread (Egbe *et al*. 2023). HBV has numerous destructive impacts on the liver, as reported by studies conducted by Zhao *et al*. (2018), Li *et al*. (2019), and Patel *et al*. (2024). These studies indicate that chronic HBV may result in liver cirrhosis, fibrosis, acute or chronic liver failure, and hepatocellular carcinoma (HCC). Disease progression may be complicated by lower immune responses. Globally, HBV affects approximately 257-262 million people, with an average of 853,600 fatalities annually attributed to cirrhosis and hepatocellular carcinoma (Alsulaimany, 2023). Africa accounts for a 6.1% prevalence of HBV despite regional vaccination programmes (Sonderup and Spearman, 2022). In Nigeria, the combined prevalence is estimated to range from 9.5% to 13.6%, highlighting its endemic status (Musa *et al*. 2015; Olayinka *et al*. 2016; Ajuwon *et al*. 2021). Previous studies by Olayinka *et al*. (2016) reported a 12.1% prevalence of HBV among apparently healthy individuals in Nigeria. The prevalence of HBV in rural areas of northern Nigeria is notably high, ranging from 10.7% in rural settings overall to 12.1% in the

northwestern region, according to recent systematic reviews and meta-analyses (Ajuwon *et al*., 2021).

Risk factors for contracting HBV include medical personnel, individuals with other sexually transmitted diseases, intravenous drug users, homosexual men and women, those with multiple sexual partners or unprotected sex, people who have sex with an HBV-infected person, recipients of blood or blood products transfusions, and infants born to infected mothers (Yeh *et al*. 2018). Rapid diagnostic kits for hepatitis B virus (HBV) are commonly used for screening in secondary and tertiary healthcare facilities in Nigeria, particularly for detecting hepatitis B surface antigen (HBsAg). These rapid test kits have demonstrated sensitivities as low as 7.3% in some settings, leading to high rates of undetected HBV cases, especially when compared to more accurate methods like enzyme-linked immunosorbent assay (ELISA) and polymerase chain reaction (PCR) (Erhabor *et al*. 2014; Desmond *et al*. 2020; Abazuh *et al*. 2023). ELISA and PCR are considered gold standards for confirmatory testing because of their higher sensitivity and ability to detect mutant HBV strains that rapid kits might miss (Afolabi *et al*. 2018; Desmond *et al*. 2020) reported that patients with HBV-DNA ≥ 2,000 IU/mL and high alanine aminotransferase (ALT) levels should commence treatment according to global guidelines.

It is crucial to understand the burden and associated risk factors of HBV infection among patients at this hospital. This knowledge will inform targeted interventions, community awareness campaigns, and policy development designed to enhance prevention, early diagnosis, and treatment strategies in the region (Ndububa *et al*., 2015). This study will provide valuable data on HBV in Maiduguri State Specialist Hospital to support epidemiological surveillance, serve as a baseline for academic research, and enhance public health education efforts, especially towards targeted interventions.

MATERIALS AND METHODS

Study Area

State Specialist Hospital Maiduguri, Nigeria, functions as a vital healthcare centre in the region, dedicated to delivering comprehensive medical services and advancing public health initiatives. The hospital is renowned for its commitment to tackling various health issues common in northeastern Nigeria, especially in infectious diseases, maternal and child health, and chronic conditions.

The research was conducted at State Specialist Hospital, Maiduguri (Figure 1), established in 1979, which is a tertiary hospital serving Borno State and neighbouring areas. It plays a crucial role as a healthcare provider in northeastern Nigeria and extends its services to surrounding countries like Niger and Cameroon.

Study Design

The retrospective study on HBV cases at the State Specialist Hospital, Maiduguri from 2017 to 2023 was conducted. Formal consent of the management of the facility was sought before accessed to the secondary data. Records were obtained from the laboratory results form for disease reporting. A total of 81,469 patient records were analyzed. All results of individuals tested for HBV during the study period (2017-2023) were included in this study.

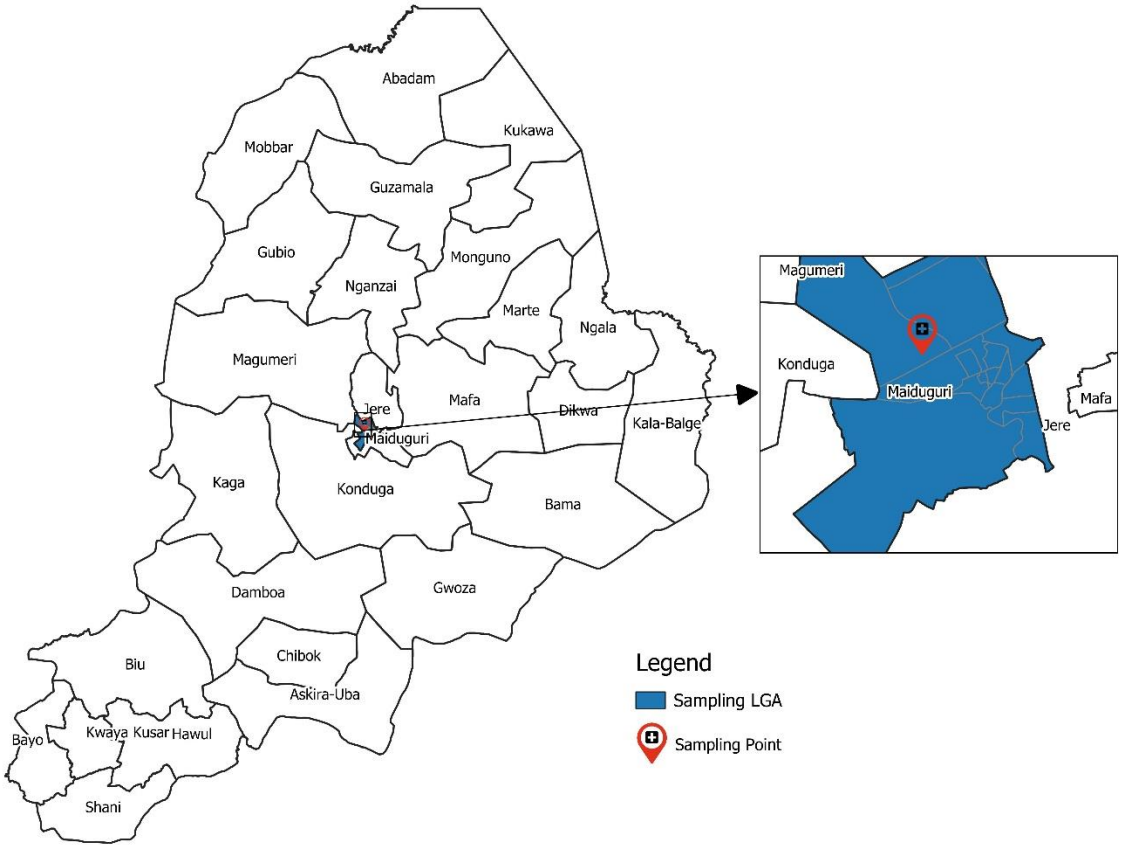

Figure 1. Map of Borno State showing the Location of State Specialist Hospital Maiduguri

Laboratory Test

Following blood sample collection through intravenously route; the sera were isolated through centrifugation. Detection of HBsAg: Latex agglutination test (Immunostics®) was performed according to the manufacturer protocol.

In Nigeria secondary facilities; Immunochromatographic test strips test kits are chosen for their speed and convenience of usage, but studies have shown that their sensitivity and specificity can vary significantly, with some kits missing a substantial number of true infections and producing false negatives (Erhabor *et al*. 2014; Afolabi *et al*. 2018; Desmond *et al*. 2020; Abazuh *et al*. 2023). The typical procedure in secondary facilities involves initial screening with a rapid test, followed by confirmatory testing with ELISA or PCR if available, especially for blood donors or high-risk individuals (Erhabor *et al*. 2014; Afolabi *et al*. 2018). However, resource limitations often mean that many facilities rely solely on rapid kits, increasing the risk of missed diagnoses and ongoing spread (Erhabor *et al*. 2014; Abazuh *et al*. 2023). This indicates the need for improved accessibility to more sensitive diagnostic methods and integration of confirmatory testing protocols in resource limited secondary facilities in Nigeria.

Data Analysis

The data retrieved from the laboratory records were analysed using Microsoft Excel 2016 and SPSS-IBM V23. The data were presented using descriptive statistics in the form of charts and tables. Chi-square tests of association ($\chi 2$) were employed to determine possible links between years, season, sex, and HBV infection. Odd ratio (OR) and 95% confidence interval (CI) were used to determine the risk estimate. $p \leq 0.05$ was considered significant throughout the study.

RESULTS

This retrospective study recorded the total number of 81469 patients tested for the presence of HBV during the period from 2017 to 2023, of whom 3171 tested positives, representing a prevalence of 3.89% within the study period. The highest annual prevalence of HBV was observed in 2018 and 2019 at 5.01% and 4.85%, respectively. The lowest annual prevalence was recorded in 2017 at 3.05%. There was a statistically significant ($p<0.05$) association between

the years and prevalence of HBV (Table 1). Seasonal data indicated that HBV prevalence was slightly higher in the dry season at 3.91% compared to the wet season at 3.88%. However, there was no statistically significant (p>0.05) association between season and HBV prevalence (Table 1). The prevalence of HBV was consistently (2017-2023) higher among female gender compared to male counterpart (Figure 2).

Table 1. Prevalence of HBV in Maiduguri Specialist Hospital from 2017-2023

Variables	Total sampled Tested	Number positive	Prevalence (%)	OR	95%CI	χ2	P-value
Gender							
Female	44003	1814	4.12	Ref			
Male	37466	1357	3.62	1.14	1.1-1.2	12.5	0.0001
Years							
2017	7583	231	3.05*	Ref		75.55	0.0001
2018	9716	487	5.0**	0.6	0.5-0.7	38.2	
2019	9770	474	4.85*	0.63	0.5-0.7	33.0	
2020	11842	410	3.46	0.9	0.7-1.03	2.3	
2021	15514	577	3.72	6.1	5.2-7.1	683.4	
2022	14628	529	3.62	0.8	0.7-1.0	4.5	
2023	12416	463	3.73	0.82	0.7-0.96	6.2	
Seasonal							
Wet	41974	1628	3.88	1.01	0.93-1.1	0.04	0.842
Dry	39495	1543	3.91	Ref			
Total	**81469**	**3171**	**3.89**				

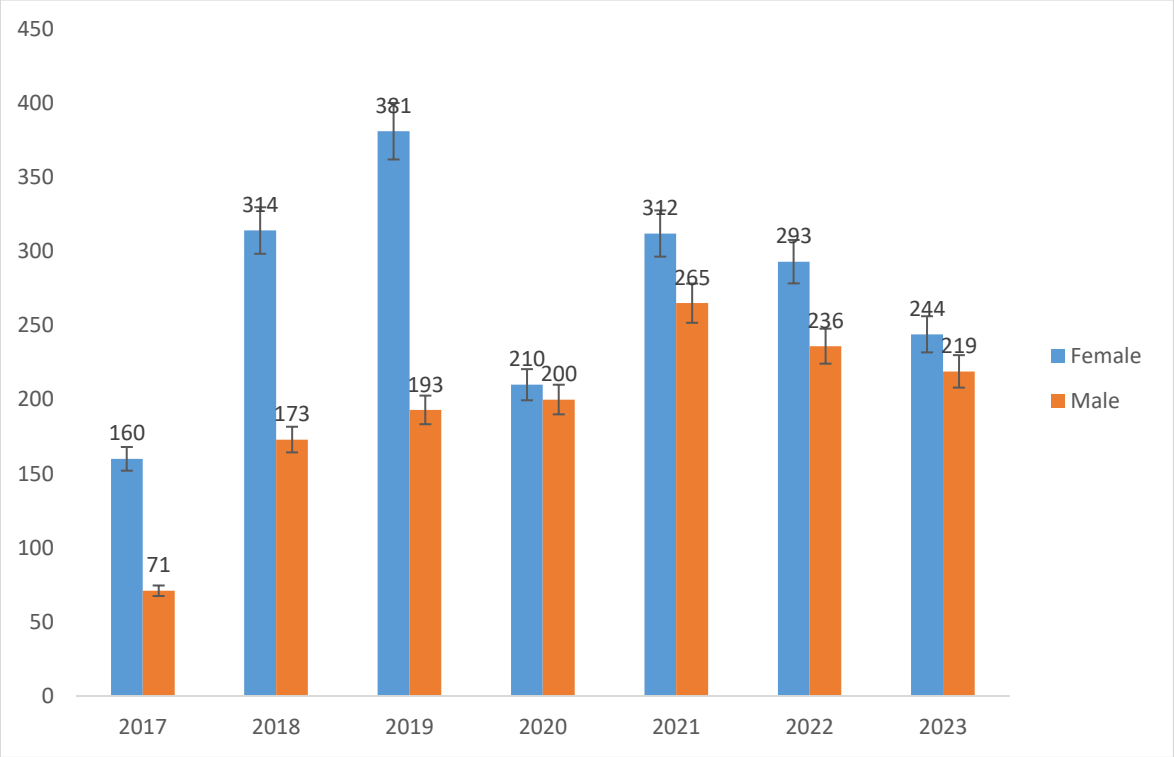

Figure 2. Sex-based frequency of HBV in Maiduguri State Specialist Hospital (2017–2023)

DISCUSSION

Hepatitis B Virus (HBV) infection remains a major public health concern globally, with a disproportionately high burden in sub-Saharan Africa, including Nigeria. In Northeastern Nigeria, particularly in Maiduguri, the epidemiology of HBV is shaped by a combination of sociocultural practices, healthcare access limitations, and conflict-related

displacement. The State Specialists' Hospital, Maiduguri, serves as a referral center in the region, making it a critical site for evaluating HBV prevalence and identifying risk patterns among patients (Bello, *et al*., 2018).

Despite extensive immunization effort among populace in the study area, still, HBV posed threat to public health. The study reported an overall prevalence of 3.89% prevalence. This is of public health concern because of its numerous modes of transmission, chronic status and neglection by the infected individuals. This may likely increase the rate of morbidity and mortality among unimmunized individuals. The reported prevalence was lower than those reported by (Aminu *et al.* 2013; Musa *et al*. 2015; Olayinka *et al*. 2016 and Ajuwon *et al*. 2021). Who reported 9.5% to 13.6% in pooled prevalence in Nigeria. The reason for the disparity may be due difference in the study design, time of study and study area. This also indicated an underestimation of prevalence of HBV using secondary data.

The prevalence of HBV was consistently (2017-2023) higher in female compared to male counterpart. This may be explained by the presence of commercial sex workers among female which serve as major route of transmission. This was in agreement with findings of Musa *et al*. (2023) who reported high prevalence among pregnant women.

(57.2%) contrasts with global trends but mirrors findings in Northern Nigeria (Ndako *et al*., 2012), possibly linked to maternal-fetal transmission and healthcare access disparities.

During the dry season, the prevalence of HBV was notably high at 3.91%. This increase may be linked to various factors, including heightened social gatherings, economic activities, and the migration of rural residents to urban areas, which could result in a greater likelihood of engaging in unprotected sex and other behaviors that elevate the risk of HBV transmission. These observations are consistent with the findings of Wang *et al*. (2018), Bai *et al*. (2021), and Kafeero *et al*. (2024), all of whom reported a higher prevalence of HBV among females. However, the study found no significant association ($P > 0.05$) between season and the occurrence of HBV. This indicates that the observed differences may not be reliable or consistent enough to draw definitive scientific conclusions.

The prevalence of HBV was higher during 2018–2019, coinciding with a significant increase in the number of Internally Displaced Persons (IDPs) in the study area, particularly in rural regions of the state. This situation arose due to humanitarian crises and insurgency. The displacement created barriers for vaccination and immunization against HBV and other vaccine-preventable diseases, as healthcare disruptions and violations of public health measures impeded access. As a result, this led to a higher prevalence of HBV in the affected population.

The transmission of HBV (Hepatitis B virus) in this context is affected by various risk factors, such as unprotected sexual activity, blood transfusions that are not properly screened, unsafe injection and surgical practices, tattooing and scarification, as well as vertical transmission from mother to child (Bello, *et al*., 2018). Additionally, the ongoing insurgency in the region has weakened the healthcare infrastructure and disrupted vaccination programs, which may further increase the risk of HBV transmission (Bello, *et al*., 2018; Ofori-Asenso *et al*., 2016).

Limitations include retrospective design and lack of viral load/PCR confirmation. Future studies should incorporate active data and molecular testing to detect occult HBV (Xu *et al*., 2015).

CONCLUSION

The study concluded that the overall prevalence of Hepatitis B virus (HBV) in Maiduguri, Borno State was 3.89%. The infection rate was higher among females (4.12%) compared to males (3.62%), with females being 1.4 times more likely to be affected than their male counterparts (OR=1.4; 95% CI: 0.93-1.1; P=0.001). No significant association was found between HBV prevalence and seasonal variation (P=0.84). To address the disease, the study recommends strengthening active surveillance, increasing vaccination coverage, ensuring safe blood transfusion practices, using disposable medical equipment, implementing prenatal screening, and enhancing public awareness efforts.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

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Authors contribution

AM and SM designed the study; SRA collected the data and prepared the first draft of the manuscript. ASS, SM, and AM supervised the research and reviewed the manuscript. SM and SRA contributed to data collation, cleaning, and managed the data analyses. Additionally, SM conducted the literature searches. All authors read and approved the final version of the manuscript.

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