Original Research Article

Sero-Prevalence and Distribution of Hepatitis B Surface Antigenaemia among People Living in Urban Settings in Rivers State of Nigeria

ABSTRACT

Background: Hepatitis B virus (HBV) infection remains a global health challenge, affecting millions of people worldwide. Globally, HBV prevalence is 3.2% and in Nigeria, the rate is 8.1%

Aim: To determine the prevalence of hepatitis B surface antigen and how certain demographics affect the distribution of the infection.

Methodology: A cross-sectional study was carried out involving 392 individuals in three LGA in Rivers State who gave their consents to participate in the project, their samples were taken and aseptically worked on using HBsAg rapid diagnostic kit and then statistically analyzed using SPSS version 28, which gave the Mann-Whitney U and Kruskal-Wallis test.

Result: The result based on demographics shows that in the age group analysis, those aged 40-50 have a higher prevalence (8.2%), while females have a lower rate (2.5%) than males (7.1%). No significant differences appear in marital status, education, or age groups. However, the test on occupation reveals a significant difference (P=0.001), with teachers having the lowest prevalence (2.2%) and applicants the highest (15.8%). The significant difference in HBsAg prevalence between males and females (P=0.028) was seen.

Conclusion: Having completed this study it has been revealed that age, gender, and occupation play significant roles in HBsAg sero-prevalence and targeted interventions may be needed, particularly focusing on occupations and sex with higher prevalence rates.

Keywords: *Demographic, Hepatitis B, Rivers State, Sero-prevalence, Study*

INTRODUCTION

Hepatitis B virus (HBV) infection remains a global health challenge, affecting millions of people worldwide. Globally, the prevalence of HBV is 3.2%, in Nigeria the rate is 8.1%, and in North West region of Nigeria a prevalence of 12.1% was reported. At the forefront of Hepatitis B diagnostics is the Hepatitis B surface antigen (HBsAg), a crucial marker indicating active infection [1]. Understanding the distribution and sero-prevalence of HBsAg is paramount in unraveling the dynamics of Hepatitis B transmission, especially within specific geographic contexts. This study delves into the sero-prevalence and distribution of Hepatitis B surface antigenemia among individuals residing in urban settings across three Local Government Areas (LGAs) in Rivers State, Nigeria.

As a viral infection, Hepatitis B manifests with diverse sero-prevalence rates across different regions. Rivers State, known for its dynamic urban communities, offers a unique backdrop for investigating the distribution of HBsAg [2]. This research aims to scrutinize the prevalence of HBsAg within distinct demographic groups, emphasizing

the impact of urban living on Hepatitis B transmission dynamics. Urban settings are characterized by population density, diverse lifestyles, and varied healthcare accessibility, which play a pivotal role in shaping the prevalence and distribution patterns in the transmission of infectious diseases [3].

The correlation between the sero-prevalence of HBsAg and urban living in Rivers State is of particular interest [2]. This study seeks to unravel the intricate interplay of demographic factors such as age, gender, education, marital status, and occupation in influencing Hepatitis B prevalence within these urban communities [4]. By employing a comprehensive approach, the research aims to illuminate the nuanced connections between Hepatitis B dynamics and the urban landscape of Rivers State [5].

The urgency of this research stems from the critical need to address the gaps in knowledge regarding Hepatitis B prevalence and distribution within urban settings in Rivers State. Understanding how HBsAg is distributed among diverse demographic groups in urban areas is essential for tailoring effective public health interventions [6]. The study's findings will provide vital insights into the specific challenges posed by urban living, guiding the development of targeted vaccination programs, healthcare policies, and awareness campaigns to curb the prevalence of Hepatitis B in this region [7]. Ultimately, this research serves as a foundational step towards mitigating the impact of Hepatitis B on the health of urban communities in Rivers State and contributes to the global effort in combating this infectious disease.

This study aims to evaluate the Sero-Prevalence of HBsAg in Urban Setting in Port Harcourt City Local Government, Obio-Akpor Local Government, and Omoku Local Government Area in Rivers State of Nigeriaby determining the general sero-prevalence of HBsAg in the study population of the area, of HBsAg based on the demographic characteristics and comparing the sero-prevalence of HBsAg across groups by demographic characteristics

Materials and method

Study Design

The study was a cross-sectional study, undertaken between March and June 2023, among subjects attending the general outpatient unit of the three selected hospitals in Rivers State situated in different local government, which included Obio Cottage Hospital, Rivers State University Teaching Hospital and General Hospital Omoku-Obrikom

Study Area

This research study was undertaken in three local governments; Port Harcourt local government, Obio-Akpor local government, and Omoku local government. Three major hospitals geographically and spatially located in the three LGAs were used as sampling sites, Obio Cottage Hospital is situated in Obio-Akpor local government, General Hospital Omoku-Obrikom is located in Omoku local government while Rivers State University teaching hospital is situated in Port Harcourt local government. Rivers State is a major petroleum industrial center and location for multinational firms, it is a

state that experiences a tropical wet climate typically characterized by long rainy seasons and short dry seasons.

Study Populations

The study was conducted using a total of 392 (154 males and 238 females) adults from different age groups comprising all outpatients from each of the selected hospitals located in the three local governments

Inclusion Criteria

Three hundred and ninety-two informed female and male registered outpatients of the three local governments amongst all the age groups who accepted and well gave their consent by endorsing the consent form were recruited and included in the research

Exclusion Criteria

Patients who had been confirmed with other ailments aside from HBV were excluded from the study. Those undergoing chemotherapy were also excluded to avoid bias in the gathered sample data, and those transferred from different local governments who were not being worked with were also excluded.

Ethical Consideration

Before starting this research work, approval was sought from the Research Ethics Committee of Rivers State University to carry out this work. The management of each sampling hospital in the three local governments permitted sample collection. A consent letter was administered to each of the participating subjects after clearly informing them about the objectives as well as the aim of the research. They were also informed of their right to participate or withdraw from the research before, during, and even after the research with no consequence. They were also educated on the confidentiality of the results of the research study

Sample Collection

Two milliliters of blood were collected via venipuncture using the vacutainer needle [8,9]. The blood collected was placed in plain bottles. It was immediately transported to the microbiology laboratory, within the Department of Animal and Environmental Biology complex, Rivers State University for serological analysis.

Hepatitis B Test

Hepatitis B antigenemia was diagnosed by allowing the blood in the plain bottle to settle and the plasma was carefully collected and used to detect hepatitis B antigen. The antigen was detected with a rapid serology assay diagnostic kit [10]

Statistical Analysis

Data obtained from the diagnosis were analyzed using SPSS software version 28. Results of the study were expressed in percentages, the Mann-Whitney U and Kruskal-Wallis test was used to conclude the significance levels between the parameters, with the significance value set at less than or equal to 0.05.

RESULTS

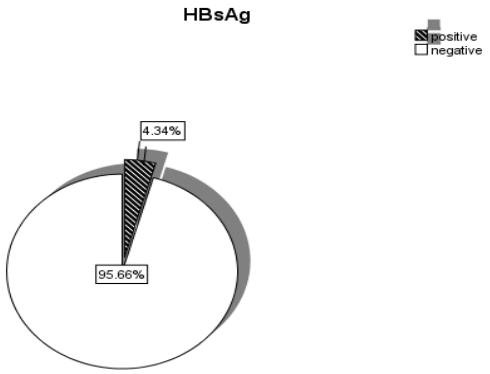

Figure 1: Pie Chart of General Sero-prevalence of HBsAg

The figure above shows the sero-prevalence of HBsAg. The result reveals that the sero-prevalence of HBsAg is 4.3%.

The table reveals varying HBsAg sero-prevalence rates across demographics. Notably, individuals aged 40-50 show the highest prevalence at 8.2%, while those below 20 exhibits no cases. Gender-wise, males have a higher prevalence (7.1%) than females (2.5%). Education-wise, those with no formal education and self-employed individuals show higher rates. Occupation-wise, applicants have the highest prevalence at 15.8%, highlighting the importance of targeted interventions based on demographic factors

Table 1: HBsAg Sero-prevalence based on Demographics

Demographics	N	HBsAg Sero-positive	HBsAg Sero-prevalence
Age (years)			
<20	51	0	0.0%
21-29	70	2	2.9%
30-39	180	9	5.0%
40-50	73	6	8.2%
51 and Above	18	0	0.0%
	392	17	4.3%
Sex			
Male	154	11	7.1
Female	238	6	2.5
Education			
no formal education	10	1	10.0
Primary	8	0	0.0
Secondary	140	8	5.7

Tertiary	234	8	3.4
Occupation			
Teacher	93	2	2.2
civil servant	73	4	5.5
self-employed	70	7	10.0
Driver	7	0	0.0
Applicant	19	3	15.8
Housewife	2	1	50.0
Health	13	0	0.0
Student	74	0	0.0
Cleaner	3	0	0.0
Security	5	0	0.0
Others	33	0	0.0

Table 2 comparing between male and female HBsAg sero-prevalence rates reveals a significant difference *P*=0.028. Males, with a mean rank of 191.00, have a lower prevalence compared to females, whose mean rank is 200.06. The p-value below 0.05 suggests a statistically significant variation.

Table 2: Comparison of the sero-prevalence of HBsAg between male and female gender

Table 2: Mann-Whitney U of Difference between Male and Female HBsAg Sero-prevalence Rate

Dependent Variable	Sex	N	Mean Rank	Sum of Ranks	Mann-Whitney U	p-value
HBsAg	Male	154	191.00	29414.00	17479.000	.028
	Female	238	200.06	47614.00		
	Total	392				

Note: p>0.05=Not Significant, p<0.05=Significant

Table 3 result on HBsAg sero-prevalence across age groups shows no significant difference (p=0.176). While there is a slight variation in mean ranks, the chi-square value does not reach significance.

Table 3: Comparison of HBsAg sero-prevalence across Age Groups

Dependent Variable	Age	N	Mean Rank	Chi-Square (Kruska-wallis)	Df	p-value
HBsAg	<20years	51	205.00	6.324	4	.176
	21-29 years	70	199.40			
	30-39 years	180	195.20			
	40-50 years	73	188.89			
	51 years & Greater	18	205.00			
	Total	392				

Note: p>0.05=Not Significant, p<0.05=Significant

Table 4 result on HBsAg sero-prevalence by marital status indicates no significant difference, giving a Chi-square value of 1.151, 3 degrees of freedom and *P*=0.765. Despite minor variations in mean ranks, the chi-square value does not reach

significance, suggesting that marital status is not a significant factor in the distribution of HBsAg prevalence.

Table 4: Comparison of HBsAg sero-prevalence by Marital Status

Dependent Variable	Marital Status	N	Mean Rank	Chi-Square (Kruska-wallis)	df	p-value
HBsAg	Single	186	194.46	1.151	3	.765
	Married	198	198.07			
	Divorced	5	205.00			
	widowed/ widower	3	205.00			
	Total	392				

Note: p>0.05=Not Significant, p<0.05=Significant

Table 5 result on HBsAg sero-prevalence by education reveals no significant difference giving a chi square value of 2.246, with 3 degrees of freedom and *P*=0.523. Although there are slight variations in mean ranks, the chi-square value does not reach significance.

Table 5: Comparison of HBsAg sero-prevalence across Educational levels

Dependent Variable	Education	N	Mean Rank	Chi-Square (Kruska-wallis)	df	p-value
HBsAg	No Formal Education	10	185.40			
	Primary	8	205.00			
	Secondary	140	193.80	2.246	3	.523
	Tertiary	234	198.30			
	Total	392				

Note: p>0.05=Not Significant, p<0.05=Significant

Table 6 result on HBsAg sero-prevalence by occupation reveals a significant difference giving 10 degrees of freedom, a chi-square value of 28.818, and *P*=0.001. Various occupations show distinct mean ranks, with teachers having the lowest prevalence (2.2%) and applicants the highest (15.8%). indicating a significant variation.

Table 6: Comparison of HBsAg sero-prevalence across Occupation

Dependent Variable	Occupation	N	Mean Rank	Chi-Square (Kruska-wallis)	df	p-value
HBsAg	Teacher	93	200.78	28.818	10	.001
	civil servant	73	194.26			
	self employed	70	185.40			
	Driver	7	205.00			
	Applicant	19	174.05			
	Housewife	2	107.00			
	Health	13	205.00			
	Student	74	205.00			
	Cleaner	3	205.00			
	Security	5	205.00			
	Others	33	205.00			
	Total	392				

Note: p>0.05=Not Significant, p<0.05=Significant

DISCUSSION

The pie chart displays the general sero-prevalence of Hepatitis B surface antigen (HBsAg) among the study population, 392 individuals were included in this study, and out of the total population, 375 individuals showed negative for HBsAg, accounting for 95.66% of the participants indicating that 17 individuals tested positive to HBsAg which represents 4.3% of the study population. Therefore, the overall sero-prevalence of Hepatitis B surface antigen among the study participants is 4.3%. In contrast, the result obtained from Bornu by [11] reported an overall prevalence of 28.8% of HBV recorded during the study period. This prevalence rate falls in the category of high endemicity as defined by [12], which states high endemicity for HBV infection as HBsAg. To interpret this result, it is obvious that a small percentage (4.3%) of the study population tested positive for HBsAg, signifying an existing prevalence of Hepatitis B surface antigenemia within this particular group. This prevalence, though relatively low, still indicates a public health concern as Hepatitis B is a viral infection that can lead to chronic liver disease, including liver cirrhosis. Even with a 4.3% prevalence rate, this indicates that a portion of the studied population is at risk of developing Hepatitis B-related complications.

Table 1 explains the sero-prevalence of Hepatitis B surface antigen (HBsAg) amongst various demographic factors, including age, education, sex and occupation through various individuals in the study population. For the different ages the result indicates an increase in HBsAg sero-prevalence, peaking in the 40-50 age group at 8.2%. Following sex the data suggest a higher HBsAg sero-prevalence among males (7.1%) compared to females (2.5%), in education individuals with no formal education exhibited higher rates of HBsAg sero-positivity at 10.0%. No cases were reported among individuals with primary education, then in the occupation category 'Housewife' demonstrates the highest prevalence at 50.0%, occupations like 'teacher', 'health worker', 'student', 'cleaner', 'security', and 'others' show no reported cases. A study by [13] was both similar and contrasting in some demographics, broadly showing that 3.5% of HIV patients were seropositive to HBsAg and the difference between sero-prevalence rates and patients' age as well as gender was not statistically significant ($p>0.05$), there was significant difference between demographic variables such as marital status and educational level. Overall, the results highlighted varying HBsAg sero-prevalence rates across different demographic segments. Age, some occupation, and lower education levels associate with higher HBsAg prevalence. Understanding these specific patterns can aid in targeted interventions and tailored public health strategies to reduce Hepatitis B transmission in these communities.

The Mann-Whitney U test conducted to compare the sero-prevalence rates of HBsAg between males and females revealed a statistically significant difference ($P = .028$) because , the Mann-Whitney U value of 17479.000 represents the number of times a random value from the male group would be lower than a random value from the

female group. This statistical significance suggests that there is a meaningful dissimilarity in HBsAg prevalence between the male and female groups within the study population a study by [14] showed the highest prevalence of HBsAg was recorded among women in the age group 21-25 years old, though the study by [15] contrasted that the males had a higher prevalence of 7.9% HBV than the females 3.4% HBV. In this context, this difference may hold important implications for public health interventions and strategies targeted at reducing Hepatitis B transmission, considering the identified variation in infection rates between genders not forgetting the fact that the diagnostic kit used could give false positive results to that of the females due to the recognition of some antigens which might not be that of Hepatitis B and could even be Human chorionic gonadotropin. While the difference in prevalence rates is statistically significant, additional research would be beneficial to delineate the precise causes underlying this gender-based variation in HBsAg sero-prevalence.

The test conducted in Table 3 result to assess the difference in HBsAg sero-prevalence across different age groups does not show a statistically significant difference (P = .176). This result suggests that, based on age, there is no significant variation in HBsAg prevalence within the study population. A similar done in Kubwa, Abuja by [16] who reported that the young adult had a higher prevalence than the older age group. According to the reports of [17] the agile group infected with hepatitis in this study poses a great risk to the people as this age group constitutes the main workforce, with high prevalence reported in the most dominant age. While the test did not detect a statistically significant difference in HBsAg prevalence among different age categories, these trends may still offer valuable insights into the potential patterns of infection across various age cohorts the reason for this insignificance could be because the study population could have been insufficient across the groups yielding to an unbalanced analysis. Further investigation with larger sample sizes or a different methodology might be needed to explore more subtle age-related variations in Hepatitis B prevalence.

The test conducted in Table 4 to evaluate the difference in HBsAg sero-prevalence across various marital status categories within the study population does not show a statistically significant difference (P = .765). This result indicates that, based on marital status, there is no significant variation in the different groups. The result in this study is dissimilar to the report of [18] which showed that singles were more prone to the infection having a higher percentage of HBsAg positive which could be because of their lifestyle or even behavioral pattern. However, with a limited number of participants in the 'Divorced' and 'widowed/widower' groups, the statistical power might be insufficient to detect significant differences. Marital status itself is not a direct risk factor for Hepatitis B. However, certain behaviors associated with divorce or widowhood could potentially increase the risk of exposure to the virus. For example, engaging in new sexual relationships without practicing safe sex or sharing needles for drug use can pose a risk.[19][20]

The results presented after analyzing the difference in HBsAg sero-prevalence across various education levels within the study population do not demonstrate a statistically significant difference (P = .523). This result indicates that, based on education levels, there is no significant variation in HBsAg prevalence among the different educational

groups, across the education categories. Although not reaching statistical significance the study of [21] shows a dissimilar result to which says that those who have tertiary forms of Education recorded the highest prevalence of infection for Hepatitis B and also the reports of [17] who reported that the prevalence of hepatitis B infection is highest amongst those with no formal education. The results from this study showed that there was no meaningful difference so it is not possible to suggest potential trends or associations because the statistics gotten were not significant though there are major disparities between other studies, it is advisable that sensitization on this infection is done and the examination of the samples were properly handled by professionals to avoid getting false results, the kit being used should also be checked and quality control should be done. However, the smaller sample sizes within certain education categories could impact the statistical power to identify significant differences.

The result shown in Table 6 is the test conducted to examine the difference in HBsAg sero-prevalence across various occupational groups within the study population revealed a statistically significant difference (P = .001). This result indicates that, in occupation, there is a meaningful variation in HBsAg prevalence among the different occupational categories. Specifically, some occupations indicated a potentially higher prevalence according to the study by [20] that reported private employees as the highest in the prevalence of HBsAg, the sero prevalence rate of applicants in this study was observed to be higher which might be caused by poor living style due to the lack of job and also even carrying out different tasks that must have predisposed these categories of individuals to the infection of the virus. This significant variation in HBsAg prevalence across different occupational groups underscores the potential occupational risk factors contributing to Hepatitis B transmission. However, in sample sizes, their disparity across occupational categories might impact the robustness of these findings. The occupational risk of exposure to infectious materials, such as hepatitis B (HBV), is a significant concern for individuals in certain occupations. According to the Occupational Safety and Health Administration (OSHA), strict adherence to universal precautions, proper use of personal protective equipment, and vaccination against Hepatitis B are crucial preventive measures for individuals in high-risk occupations [22].

CONCLUSION

The sero-prevalence study of Hepatitis-B surface antigen provides a comprehensive analysis of a study population of 392 individuals, revealing interesting trends across demographic factors. The overall prevalence of 4.3% indicates a relatively low but concerning level of HBsAg positivity within the groups,Having completed this study it has been revealed that age, gender, and occupation play significant roles in HBsAg sero-prevalence and targeted interventions may be needed, particularly focusing on occupations and sex with higher prevalence rates, warranting public health attention due to the potential complications associated with Hepatitis B.

RECOMMENDATION

Further exploration into the factors contributing to most discrepancies such as behavioral patterns, occupational exposure, healthcare-seeking behavior, or biological differences should be done as this could provide valuable insights into designing more

targeted and effective interventions, also there is a need to sensitize individuals on the need of being vaccinated.

LIMITATION

The seroprevalence observed in this study may accurately represent the disease burden in the study area, given that only hospital-based cases were included. However, the findings might not be applicable nationwide, as they diverged from results in some published studies from other regions of Nigeria. Despite these limitations, this research establishes fundamental seroprevalence data for HBsAg co-morbidity, serving as a baseline for future studies.

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