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SEROLOGICAL EVIDENCE OF HEPATITIS B SURFACE ANTIBODY AMONG PREGNANT WOMEN ATTENDING A TEACHING HOSPITAL IN PORT HARCOURT, NIGERIA

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Abstract: This study determined the prevalence of hepatitis B surface antibody (anti-HBs or HBsAb) among pregnant women attending the antenatal clinic of Rivers State University Teaching Hospital (RSUTH), Port Harcourt, Nigeria. A total of 93 pregnant women were enrolled in the study. Blood samples were collected from the participants and centrifuged to obtain serum. The separated sera were tested for the presence of anti-HBs using the HBsAb One Version ULTRA fourth-generation enzyme-linked immunosorbent assay (ELISA) kits (DIA.PRO, Italy), according to the manufacturer's instructions. Sociodemographic information, including age, educational status, marital status, and occupation, was obtained from the participants' hospital records. Of the 93 pregnant women tested, 11 (11.8%) were positive for anti-HBs. Pregnant women aged 31–40 years recorded the highest prevalence of anti-HBs positivity (17.4%). Based on marital status, married women had a higher prevalence of anti-HBs positivity (18.0%) compared with single women (4.7%). Based on educational status, pregnant women with secondary education had a higher prevalence of anti-HBs positivity (16.0%) compared with other categories. Based on occupation, house wives had a higher prevalence of anti-HBs positivity (13.8%) compared with other occupational categories. Overall, although variations in HBsAb positivity were observed across the different sociodemographic categories, none of the assessed sociodemographic characteristics showed a statistically significant association with HBsAb positivity ($p > 0.05$). The study demonstrates the presence of hepatitis B surface antibodies among pregnant women attending RSUTH, suggesting previous exposure to hepatitis B virus and/or immunity resulting from vaccination or resolved infection. Further studies incorporating other HBV serological markers, particularly HBsAg and anti-HBc, are recommended to distinguish vaccine-induced immunity from immunity following natural infection. Routine HBV screening and appropriate vaccination and preventive interventions during antenatal care remain important components of HBV control.

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1. INTRODUCTION

Hepatitis B remains an important public health problem globally despite the availability of a safe and effective vaccine and other preventive interventions (Eleje et al., 2021; Raheem et al., 2026). Hepatitis B infection is a major public health problem in Nigeria, and sexually active individuals such as pregnant women may be at increased risk. As a result of the poor screening and low vaccination rate, the vertical transmission of HBV has become a major route of transmission of the virus in Nigeria. This leaves the children born at risk of developing chronic liver disease later in life (Ojiegbe et al., 2018; Oliveira et al., 2018; Eleje et al., 2021; Raheem et al., 2026).

Hepatitis B virus (HBV) infection remains an important public health problem in Nigeria (Raheem et al., 2026), particularly because infection acquired during the perinatal and early-life periods has a high likelihood of progressing to chronic disease. There is increased maternal and perinatal death associated with the HBV infection during pregnancy (Ojiegbe et al., 2018; Oliveira et al., 2018; Eleje et al., 2021). Pregnant women are an important population for HBV-related surveillance because antenatal care

provides an opportunity to identify women at risk, assess their serological status, and implement interventions to prevent mother-to-child transmission. A systematic review and meta-analysis of 20 Nigerian studies involving 26,548 pregnant women estimated the pooled prevalence of HBV infection, defined by hepatitis B surface antigen (HBsAg) positivity, at 6.49%, confirming the continuing burden of HBV infection among pregnant women in Nigeria (Olakunde et al., 2021).

The burden of HBV among pregnant women is particularly important because mother-to-child transmission remains a major mechanism for maintaining HBV transmission in high- and intermediate-endemic settings. Whereas the consequences of an acute hepatitis B infection in pregnancy may include gestational diabetes mellitus (GDM), preterm labor leading to preterm birth, chronic HBV in pregnancy increases the risk of progression to cirrhosis (Wu et al., 2020; Eleje et al., 2021; Asafo-Agyei & Samant, 2025). The pregnancy complications may interact with maternal HBV infection and hepatitis flares, leading to serious and lethal complications, which could be unpredictable and unpreventable with antiviral treatment (Lao, 2020; Eleje et al., 2021; Ugwu et al., 2023). Consequently, prevention strategies increasingly emphasize antenatal identification of HBV infection, timely linkage to appropriate care, and immunization of infants. The Nigerian evidence base, however, has historically concentrated on HBsAg prevalence, which provides information about current HBV infection, while considerably less attention has been given to anti-HBs (HBsAb), a marker associated with immunity to HBV. This distinction is important because HBsAg and anti-HBs represent different aspects of HBV serology and should not be used interchangeably.

Anti-HBs develops following successful hepatitis B vaccination or following recovery from natural HBV infection. Therefore, determining anti-HBs seropositivity among pregnant women can provide useful information about the proportion of women with detectable serological evidence of protection against HBV. However, anti-HBs positivity alone cannot distinguish vaccine-induced immunity from immunity acquired following previous natural infection; interpretation is improved by assessment of additional markers such as HBsAg and anti-HBc. Thus, studies specifically examining anti-HBs among pregnant women can complement the extensive Nigerian literature on HBsAg prevalence and provide an additional perspective on HBV prevention and serological protection.

Evidence suggests that hepatitis B vaccination coverage among Nigerian pregnant women remains inadequate. In a national pilot study involving pregnant women attending antenatal care in six tertiary hospitals representing Nigeria's geopolitical zones, only 21 of 159 women (13.2%) reported receiving at least one dose of hepatitis B vaccine, while only 8 women (5.0%) had received three doses. Lack of awareness was the most frequently reported reason for non-vaccination, accounting for 60.1% of reported reasons for non-uptake (Eleje et al., 2021). These findings raise concerns about the level of HBV-related protective immunity among women of reproductive age and highlight the need to strengthen vaccination awareness and preventive services within antenatal care.

The Nigerian evidence also demonstrates substantial geographical and sociodemographic variation in HBV epidemiology. Olakunde et al. (2021) reported considerable heterogeneity among studies of pregnant women in Nigeria and found that HBV prevalence was significantly lower among women with at least secondary education than among those with primary or no education. However, HBV prevalence did not differ significantly according to age or marital status in the pooled analysis. These observations suggest that sociodemographic characteristics may influence aspects of HBV prevention and exposure, but their relationship with specific serological markers such as anti-HBs requires further investigation.

Despite the substantial evidence describing HBV infection among pregnant women in Nigeria, there remains comparatively limited information on the prevalence and distribution of anti-HBs among pregnant women attending antenatal clinics, particularly in the South-South region. This represents an important evidence gap because a population may have a measurable burden of HBV infection while simultaneously having inadequate serological evidence of protection. Establishing the prevalence of anti-HBs can therefore provide useful baseline information for evaluating HBV prevention programmes and identifying populations that may benefit from improved vaccination awareness and access.

Against this background, the present study investigated the prevalence of hepatitis B surface antibody (anti-HBs/HBsAb) among pregnant women

attending antenatal care at Rivers State University Teaching Hospital (RSUTH), Port Harcourt, Nigeria. The study also examined the distribution of anti-HBs positivity according to selected sociodemographic characteristics. By focusing on anti-HBs rather than HBsAg alone, the study provides complementary information on the serological profile of pregnant women and contributes to the limited Nigerian literature on HBV-related antibody status in this population.

2. MATERIAL AND METHODS

2.1. Study Area

This study was carried out Rivers State University Teaching Hospital (RSUTH) located at Harley Street, Port-Harcourt, 00000, old GRA road, Rivers State Nigeria with co-ordinate 4º 46' 49'' N and 7º 0' 56'' E. A cross-sectional study was carried out among pregnant women in Rivers State University Teaching Hospital (RSUTH) located in Rivers State, Nigeria. This was done to have more representative study patients (sample). Informed consent of the subjects and approval for the study were duly obtained from the patients and the hospital management respectively. A total of 100 apparently healthy pregnant women attending their antenatal at the hospital with their demographic data were collected with well-designed questionnaire forms.

2.2. Sample Collection

About 4 ml of blood was aseptically taken by venipuncture technique into sterile EDTA bottles and plasma samples were obtained after centrifugation. Samples were transported in a cold ice chain through an available transport system to the Virus & Genomics Research Unit, Department of Microbiology, in the University of Port Harcourt where it was appropriately labelled. The blood was allowed to clot and centrifuge at 3000 rpm for 5 minutes. The plasma were carefully aspirated into plain bottles and stored in two aliquots at -20ºC and 80ºC until analyzed.

2.3. Serological Analysis

The serological analysis of Pregnant women attending antenatal at Rivers State University Teaching Hospital Rivers State, Nigeria for anti HBsAb antibodies was determined using the enzyme linked immunosorbent assay (ELISA) (DIA.PRO Diagnostic Milano-Italy). The serological evaluation and result interpretation were carried out as stipulated by the kit's manufacturer. Microplates are coated with preparation of highly purified HBsAg that in the first incubation with the sample specifically captures anti HBsAg antibodies to the solid phase. After washing, captured antibodies are detected by an HBsAg, labelled with peroxidase (HRP), that specifically bind the second available binding site of these antibodies. The enzyme specifically bound wells, by acting on the substrate/chromogen mixture, generates an optical signal that is proportional to the amount of HBsAb in the sample and can be detected by an ELISA reader.

2.4. Data Analysis

Results were presented in proportions. We engaged Chi-square test and Fisher's exact test to ascertain variances amid groups at $p < 0.05$ significance.

3. RESULTS AND ANALYSIS

The socio demographic information factors considered were sample size, age groups, marital status, occupation, educational status.

3.1. Overall Prevalence

Table 1 presents the prevalence of hepatitis B surface antibody (HBsAb) and its distribution according to selected sociodemographic characteristics of the 93 pregnant women studied. Overall, 11 (11.8%) of the participants tested positive for HBsAb, while 82 (88.2%) tested negative.

With respect to age, the highest prevalence of HBsAb positivity was observed among women aged <20 years, with 4 (17.4%) of 23 participants testing positive, followed by those aged 31–40 years, with 2 (16.7%) of 12 participants. HBsAb positivity was observed in 3 (10.7%) of the 28 women aged 26–30 years and 2 (6.7%) of the 30 women aged 20–25 years. However, there was no statistically significant association between age group and HBsAb positivity ($p = 0.626$).

Regarding marital status, HBsAb positivity was higher among married women, with 9 (18.0%) of 50 married participants testing positive, compared with 2 (4.7%) of 43 single participants. Although the prevalence was notably higher among married women, the association between marital status and HBsAb positivity was not statistically significant at the 5% level (Fisher's exact test, $p = 0.058$).

For educational status, HBsAb positivity was highest among women with secondary education, with 4 (16.0%) of 25 participants testing positive, followed by those with primary education, 3 (14.3%) of 21, while women with tertiary education had the lowest prevalence, 4 (8.5%) of 47. The difference in HBsAb positivity across educational categories was not statistically significant ($p = 0.596$).

With respect to occupation, housewives recorded the highest prevalence of HBsAb positivity, with 4 (13.8%) of 29 participants testing positive, followed by those engaged in business, 3 (13.0%) of 23. Students had a prevalence of 2 (10.0%) of 20, while traders recorded the lowest prevalence, 2 (9.5%) of 21. There was no statistically significant association between occupation and HBsAb positivity (p = 0.958).

Overall, although variations in HBsAb positivity were observed across the different sociodemographic categories, none of the assessed sociodemographic characteristics showed a statistically significant association with HBsAb positivity (p > 0.05).

Table 1: Prevalence of HBsAb and Sociodemographic Characteristics of the Pregnant Women

Variables	Categories	No. tested (%)	No. positive (%)	No. negative (%)	χ^2	P value
Age groups (years)	<20	12 (12.9)	2 (16.7)	19 (82.6)	**1.752**	**0.626[a]**
	20–25	30 (32.3)	2 (6.7)	28 (93.3)		
	26–30	28 (30.1)	3 (10.7)	25 (89.3)		
	31–40	23 (24.7)	4 (17.4)	10 (83.3)		
Marital status	Singles	43 (46.2)	2 (4.7)	41 (95.3)		**0.058[b]**
	Married	50 (53.8)	9 (18.0)	41 (82.0)		
Educational status	Primary	21 (22.6)	3 (14.3)	18 (85.7)	**1.035**	**0.596[a]**
	Secondary	25 (26.9)	4 (16.0)	21 (84.0)		
	Tertiary	47 (50.5)	4 (8.5)	43 (91.5)		
Occupation	Housewife	29 (31.2)	4 (13.8)	25 (86.2)	**0.311**	**0.958[a]**
	Student	20 (21.5)	2 (10.0)	18 (90.0)		
	Business	23 (24.7)	3 (13.0)	20 (87.0)		
	Traders	21 (22.6)	2 (9.5)	19 (90.5)		
Total		**93 (100.0)**	**11 (11.8)**	**82 (88.2)**		

[a] Pearson's chi-square test; [b] Fisher's exact test.

4. DISCUSSION

The present study determined the prevalence of hepatitis B surface antibody (anti-HBs/HBsAb) among pregnant women attending antenatal care at Rivers State University Teaching Hospital (RSUTH), Port Harcourt, Nigeria. Of the 93 pregnant women tested, 11 (11.8%) were positive for anti-HBs, while 82 (88.2%) were negative. This finding indicates that a relatively small proportion of the study population had detectable anti-HBs at the time of testing. Anti-HBs is an important serological marker associated with protection against HBV, particularly following successful vaccination. An anti-HBs concentration of ≥10 mIU/mL measured after completion of the primary vaccination series is generally considered a marker of protection (World Health Organization [WHO], 2017). However, because anti-HBs may also develop following recovery from natural HBV infection, anti-HBs positivity alone cannot distinguish vaccine-induced immunity from immunity acquired following previous infection (WHO, 2017).

The 11.8% anti-HBs seropositivity observed in the present study is higher than the 10.0% prevalence of anti-HBs reported in Ozuoba community, Rivers State, Nigeria, by Agbagwa et al. (2018). This 11.8% is lower than the 98.0% prevalence of anti-HBs reported in Port Harcourt Metropolis, Rivers State, Nigeria, by Awanye et al. (2023), the 26.1% prevalence of anti-HBs reported among traditional birth attendants and pregnant women in Ibadan, Nigeria, by Nejo et al. (2024) and the 54.5% prevalence reported in a population of Rivers State, Nigeria by Ugboma et al. (2026). In that study by Nejo et al. (2024), the investigators evaluated several HBV serological markers and reported detectable anti-HBs among 26.1% of participants. Differences between the two studies may be related to differences in study populations,

geographical location, vaccination history, previous exposure to HBV, healthcare utilization, and methodological approaches. The Ibadan study included traditional birth attendants as well as pregnant women, whereas the present study was restricted to pregnant women attending a teaching hospital. Such population differences may partly explain the variation in anti-HBs seroprevalence (Nejo et al., 2024).

The relatively low proportion of anti-HBs-positive women observed in this study may also reflect limited uptake of hepatitis B vaccination among pregnant women in Nigeria. A national pilot study conducted among pregnant women attending antenatal care in six tertiary hospitals across Nigeria reported that only 13.2% of participants had received at least one dose of hepatitis B vaccine, while only 5.0% had received three doses. Lack of awareness of the vaccine was the most frequently reported reason for non-uptake (Eleje et al., 2021). Although the present study did not collect detailed vaccination histories, the low level of anti-HBs seropositivity observed may indicate an important gap in HBV preventive immunity within the study population. Nevertheless, this interpretation should be made cautiously because anti-HBs can result from either vaccination or previous natural infection.

The age-specific findings showed that participants aged <20 years had the highest anti-HBs prevalence (17.4%), followed by those aged 31–40 years (16.7%), while women aged 20–25 years had the lowest prevalence (6.7%). However, the observed differences were not statistically significant ($p = 0.626$). This suggests that age was not significantly associated with anti-HBs seropositivity among the women studied. The higher prevalence among women aged <20 years may potentially reflect previous vaccination or other exposure-related factors, but the small number of participants in this age group limits the strength of such an interpretation. Moreover, because the study did not assess vaccination history or other HBV markers, the reason for anti-HBs positivity cannot be established solely from age distribution. However, in a study by Ugboma et al. (2026), HBsAb results showed that the highest prevalence was the most with aged 21-30 years.

The absence of a statistically significant relationship between age and anti-HBs positivity is consistent with findings of Agbagwa et al. (2018) and other findings from Nigerian studies examining HBV-related serological outcomes among pregnant women. Although these studies primarily assessed HBsAg rather than anti-HBs, they demonstrate that age does not necessarily constitute an independent determinant of HBV serological status. Omatola and Ojo (2021), in a systematic review and meta-analysis of HBV infection among pregnant women in Nigeria, reported substantial variation in prevalence across populations but did not establish age as a consistent determinant of infection. Therefore, the age-related differences observed in the present study should be interpreted as descriptive rather than evidence of an established association.

With respect to marital status, married women had a higher anti-HBs positivity rate (18.0%) than single women (4.7%). Although this represents a considerable difference in the observed proportions, the association was not statistically significant (Fisher's exact test, $p = 0.058$). The finding may suggest differences in previous exposure to HBV, vaccination history, or healthcare utilization between the two groups, but the study design and available data do not permit a definitive explanation. The p-value was close to the conventional significance threshold of 0.05; nevertheless, it should not be described as statistically significant. A larger study population may be required to determine whether the observed difference represents a true association.

The finding regarding marital status is broadly consistent with evidence from Nigerian studies in which marital status has not consistently demonstrated a significant association with HBV-related serological outcomes among pregnant women. For example, previous research among pregnant women in Nigeria has reported that sociodemographic characteristics, including marital status, may not independently explain differences in HBV infection status (Ifeorah & Ilozue, 2016). This supports the interpretation that the higher anti-HBs prevalence observed among married women in the present study should be regarded as an observed pattern rather than a statistically established relationship. However, in a study by Ugboma et al. (2026), HBsAb results showed that the highest prevalence was the most with the married.

Regarding educational status, women with secondary education had the highest prevalence of anti-HBs positivity (16.0%), followed by those with primary education (14.3%), while women with tertiary education had the lowest prevalence (8.5%). The difference was not statistically significant ($p = 0.596$). This finding suggests that educational attainment was not significantly associated with anti-HBs seropositivity in this study population. Although

education may influence knowledge about HBV transmission and vaccination, formal educational attainment does not necessarily translate into vaccination uptake or protective immunity. However, in a study by Ugboma et al. (2026), HBsAb results showed that the highest prevalence was the most with pregnant women who held a tertiary education.

This observation is particularly relevant in the Nigerian context. Eleje et al. (2021) reported that hepatitis B vaccination uptake among pregnant women in Nigeria was poor and identified lack of awareness as the most common reason for non-vaccination. Although education showed an association with vaccination uptake in the initial analysis, this association did not remain statistically significant after adjustment for other factors (Ogbuabor et al., 2021). Thus, the present finding suggests that interventions aimed at improving HBV prevention among pregnant women should not rely solely on formal education but should also incorporate targeted antenatal health education, provider recommendations, vaccine availability, and accessibility.

With respect to occupation, housewives recorded the highest anti-HBs prevalence (13.8%), followed by women engaged in business (13.0%), students (10.0%), and traders (9.5%). However, the differences were not statistically significant ($p = 0.958$). This indicates that occupation was not significantly associated with anti-HBs seropositivity in the study population. The relatively similar prevalence across occupational categories further suggests that occupational classification may have limited explanatory value for anti-HBs status in this particular population.

The relatively low prevalence of anti-HBs observed in this study has important implications for HBV prevention during pregnancy and the perinatal period. WHO recommends universal hepatitis B vaccination of infants, with the first dose administered as soon as possible after birth, preferably within 24 hours, as an important intervention for preventing perinatal HBV transmission (WHO, 2017). For pregnant women who are confirmed to have active HBV infection, particularly those with high viral loads, WHO recommends additional interventions to reduce the risk of mother-to-child transmission, including antiviral prophylaxis in eligible women (WHO, 2020). Thus, antenatal care provides an important opportunity for HBV screening, vaccination assessment, health education, and linkage to appropriate care.

However, the interpretation of the present findings requires caution. Anti-HBs negativity does not, by itself, establish active HBV infection or prove susceptibility to infection. Similarly, anti-HBs positivity alone cannot establish whether immunity resulted from vaccination or previous natural infection. A more complete assessment of HBV serological status would require additional markers, particularly HBsAg and anti-HBc. According to WHO (2017), individuals with immunity following vaccination generally demonstrate anti-HBs without evidence of anti-HBc, whereas individuals who have recovered from natural infection may have both anti-HBs and anti-HBc. Consequently, future studies involving pregnant women in Port Harcourt should consider evaluating a complete HBV serological profile alongside documented vaccination history.

The findings also emphasize the need to strengthen HBV prevention services within antenatal care. Nigeria continues to face challenges in hepatitis B vaccination coverage among pregnant women, and the low vaccination uptake documented nationally provides an important context for interpreting the relatively low anti-HBs seropositivity observed in this study (Eleje et al., 2021). Improving awareness, ensuring access to vaccination, and integrating HBV prevention into routine antenatal services could contribute to better protection of women and, importantly, their newborns.

Overall, the present study demonstrated 11.8% anti-HBs seropositivity among pregnant women attending RSUTH, with no statistically significant association between anti-HBs positivity and age, marital status, educational status, or occupation. Although married women showed a higher observed prevalence than single women and women aged <20 years had the highest age-specific prevalence, these differences were not statistically significant. The findings provide useful preliminary evidence of HBV-related serological status among pregnant women in Port Harcourt. However, because the study measured anti-HBs alone, the findings should be interpreted as evidence of anti-HBs seropositivity rather than active HBV infection or confirmed vaccine-derived immunity. Further studies incorporating HBsAg, anti-HBc, quantitative anti-HBs titres, and documented vaccination history would provide a more comprehensive understanding of HBV immunity and exposure among pregnant women in the study area.

5. CONCLUSION

This study has shown that the prevalence of HBsAb was low (10.8%). Our findings indicated that prevalence of anti-HBsAb has an insignificant association with age and sex. It further showed that 90.0% were anti-HBsAb seronegative and hence, more susceptible to HBV infection. Vaccination programme should be further reinforced to grasp those still at highest risk. Thus, it should be envisaged that proper implementation of interventions such as early immunization and screening of high-risk groups could further reduce HBV burden as well as improve Nigeria's socioeconomic indices

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