

Vaccination Gaps and Hepatitis B Prevalence Among Pregnant Women in Bauchi State: A Call for Strengthened Immunization Efforts

Murtala Jibril, Maimuna Umar Maigari, Rabi'u Alhaji Sule

Submitted to: JMIR Preprints
on: May 03, 2025

Disclaimer: © The authors. All rights reserved. This is a privileged document currently under peer-review/community review. Authors have provided JMIR Publications with an exclusive license to publish this preprint on its website for review purposes only. While the final peer-reviewed paper may be licensed under a CC BY license on publication, at this stage authors and publisher expressly prohibit redistribution of this draft paper other than for review purposes.

Table of Contents

Original Manuscript.....	5
---------------------------------	----------

Preprint
JMIR Publications

Vaccination Gaps and Hepatitis B Prevalence Among Pregnant Women in Bauchi State: A Call for Strengthened Immunization Efforts

Murtala Jibril¹; Maimuna Umar Maigari¹; Rabiuh Alhaji Sule²

¹Department of Human Anatomy Bauchi State University Bauchi NG

²BSPHCB Bauchi NG

Corresponding Author:

Murtala Jibril

Department of Human Anatomy

Bauchi State University

Bauchi State university Gadau

Bauchi

NG

Abstract

Background: Hepatitis B Virus (HBV) remains a major public health concern, particularly among vulnerable populations such as pregnant women. This study aimed to investigate the correlation between HBV prevalence and vaccination coverage among pregnant women in Bauchi State, Nigeria. A cross-sectional survey of 150 participants was conducted to assess socio-demographic factors, vaccination status, and health history related to HBV. The results showed that 57.5% of participants reported being vaccinated, with only 25.5% completing the full vaccination series. HBV prevalence was recorded at 21.38%, while 13.7% of participants were unsure of their HBV status. Chi-square analysis revealed no significant correlation between vaccination coverage and HBV diagnosis ($p = 0.586$). Logistic regression identified occupation and prior testing as significant factors influencing vaccination completion ($p < 0.05$). Key barriers to vaccination included lack of awareness (17.0%) and forgetfulness (14.4%). Despite moderate vaccination coverage, a substantial portion of participants had not completed the full vaccination series, undermining efforts to achieve full immunization and control HBV spread. The findings highlight the need for improved public health interventions, including educational campaigns to raise awareness and increase vaccination completion rates among pregnant women in the region. Further research is needed to explore additional barriers to vaccination and optimize strategies for preventing HBV transmission in high-risk populations.

Objective: This study aimed to investigate the correlation between HBV prevalence and vaccination coverage among pregnant women in Bauchi State, Nigeria.

Methods: A cross-sectional survey of 150 participants was conducted to assess socio-demographic factors, vaccination status, and health history related to HBV.

Results: The results showed that 57.5% of participants reported being vaccinated, with only 25.5% completing the full vaccination series. HBV prevalence was recorded at 21.38%, while 13.7% of participants were unsure of their HBV status. Chi-square analysis revealed no significant correlation between vaccination coverage and HBV diagnosis ($p = 0.586$). Logistic regression identified occupation and prior testing as significant factors influencing vaccination completion ($p < 0.05$). Key barriers to vaccination included lack of awareness (17.0%) and forgetfulness (14.4%). Despite moderate vaccination coverage, a substantial portion of participants had not completed the full vaccination series, undermining efforts to achieve full immunization and control HBV spread.

Conclusions: The findings highlight the need for improved public health interventions, including educational campaigns to raise awareness and increase vaccination completion rates among pregnant women in the region.

(JMIR Preprints 03/05/2025:76886)

DOI: <https://doi.org/10.2196/preprints.76886>

Preprint Settings

1) Would you like to publish your submitted manuscript as preprint?



Please make my preprint PDF available to anyone at any time (recommended).

Please make my preprint PDF available only to logged-in users; I understand that my title and abstract will remain visible to all users.

Only make the preprint title and abstract visible.

No, I do not wish to publish my submitted manuscript as a preprint.

2) If accepted for publication in a JMIR journal, would you like the PDF to be visible to the public?

✓ **Yes, please make my accepted manuscript PDF available to anyone at any time (Recommended).**

Yes, but please make my accepted manuscript PDF available only to logged-in users; I understand that the title and abstract will remain visible to all users.

Yes, but only make the title and abstract visible (see Important note, above). I understand that if I later pay to participate in <https://www.jmir.org/>

No. Please do not make my accepted manuscript PDF available to anyone. I understand that if I later pay to participate in <https://www.jmir.org/>



Original Manuscript

Vaccination Gaps and Hepatitis B Prevalence Among Pregnant Women in Bauchi State: A Call for Strengthened Immunization Efforts

Murtala M. Jibril, Maimuna Umar Maigari, Rabiuh Alhaji Sule

Abstract

Hepatitis B Virus (HBV) remains a major public health concern, particularly among vulnerable populations such as pregnant women. This study aimed to investigate the correlation between HBV prevalence and vaccination coverage among pregnant women in Bauchi State, Nigeria. A cross-sectional survey of 150 participants was conducted to assess socio-demographic factors, vaccination status, and health history related to HBV. The results showed that 57.5% of participants reported being vaccinated, with only 25.5% completing the full vaccination series. HBV prevalence was recorded at 21.38%, while 13.7% of participants were unsure of their HBV status. Chi-square analysis revealed no significant correlation between vaccination coverage and HBV diagnosis ($p = 0.586$). Logistic regression identified occupation and prior testing as significant factors influencing vaccination completion ($p < 0.05$). Key barriers to vaccination included lack of awareness (17.0%) and forgetfulness (14.4%). Despite moderate vaccination coverage, a substantial portion of participants had not completed the full vaccination series, undermining efforts to achieve full immunization and control HBV spread. The findings highlight the need for improved public health interventions, including educational campaigns to raise awareness and increase vaccination completion rates among pregnant women in the region. Further research is needed to explore additional barriers to vaccination and optimize strategies for preventing HBV transmission in high-risk populations.

Keywords: Hepatitis B Virus, vaccination coverage, HBV prevalence, pregnant women

Introduction

Hepatitis B Virus (HBV) is a blood-borne pathogen that predominantly targets the liver, causing a range of diseases, from acute hepatitis to chronic conditions like cirrhosis and hepatocellular carcinoma (HCC). As one of the leading causes of chronic liver disease, HBV represents a significant global health issue, especially in regions where it remains endemic. Transmission of HBV primarily occurs through contact with infected blood and body fluids, including sexual transmission and from mother to child during childbirth (World Health Organization, 2020). Despite the introduction of an effective HBV vaccine in the late 1980s, which has significantly reduced transmission rates, HBV continues to pose a public health challenge, contributing to high morbidity and mortality globally (Lavanchy, 2019).

With an estimated 2 billion people having been infected with HBV at some point, and over 350 million individuals living with chronic infections, the burden of this virus is immense. Chronic HBV infection is responsible for up to 80% of hepatocellular carcinoma cases worldwide, making it the second most significant carcinogen after tobacco (Owolabi et al., 2018). In highly endemic areas, such as parts of Africa and Asia, the virus continues to be a major health threat. The World Health Organization (WHO) reports that HBV accounts for approximately 600,000 deaths annually, emphasizing the need for ongoing efforts to combat the virus (Centers for Disease Control and Prevention, 2020).

Nigeria, in particular, faces a severe HBV burden, with prevalence rates among the population ranging from 9% to 39%, depending on the region (Owolabi et al., 2018). In regions with rates exceeding 7%, HBV is considered hyperendemic, which highlights its significant public health implications. Transmission in Nigeria occurs not only through sexual contact and blood transfusions but also perinatally from mother to child. In sub-Saharan Africa, where both HBV and Human Immunodeficiency Virus (HIV) co-exist at high rates, the risk of co-infection further exacerbates the health challenges faced by the population. The WHO estimates that 5-

10% of global HIV cases can be linked to transfusion of contaminated blood, suggesting that HBV, along with other blood-borne pathogens, remains widespread in regions where blood screening is inadequate (Centers for Disease Control and Prevention, 2020).

Screening for Hepatitis B Surface Antigen (HBsAg) is critical for identifying acute or chronic HBV infections. However, resource-constrained settings, such as Nigeria, often struggle with insufficient screening efforts due to financial, logistical, and infrastructural barriers. This limitation plays a significant role in the ongoing transmission of HBV, especially among vulnerable populations, such as pregnant women (Owolabi et al., 2018). For pregnant women, HBV presents unique challenges. The virus can be asymptomatic or produce mild symptoms, making it difficult to detect without targeted screening. More concerning is the risk of mother-to-child transmission (MTCT), which can lead to chronic HBV infection in newborns (American Association for the Study of Liver Diseases, 2019).

Although antiviral therapy has been shown to reduce perinatal transmission, its application during pregnancy, particularly in resource-limited settings, remains inconsistent. In cases of acute hepatitis during pregnancy, treatment is largely supportive, aimed at preventing liver failure, but chronic HBV infection often remains undetected and untreated, exacerbating the long-term risk of liver disease. Despite these challenges, comprehensive vaccination programs have proven to be the most effective tool in reducing HBV transmission, particularly when combined with screening and early intervention (American Association for the Study of Liver Diseases, 2019).

In Bauchi State, Nigeria, HBV remains highly endemic. While vaccination programs have been introduced, gaps in coverage persist, particularly among high-risk groups such as pregnant women. These gaps pose a significant public health challenge, as pregnant women are a key demographic in the transmission cycle of HBV. Vaccination coverage, especially when incomplete, undermines efforts to eliminate the virus. Understanding the extent of these gaps and their correlation with HBV prevalence is critical for developing targeted interventions aimed at reducing HBV transmission and improving maternal and infant health outcomes (Uneke et al., 2019).

Given the persistent burden of HBV and the importance of vaccination in controlling its spread, this study aims to investigate the correlation between HBV prevalence and vaccination coverage among pregnant women in Bauchi State. By identifying gaps in vaccination coverage and understanding the factors contributing to ongoing HBV transmission, this research seeks to inform public health strategies to enhance HBV control efforts in this hyperendemic region.

Table 1. Socio-Demographic Characteristics of Study Participants n = 150

Item	Frequency	Percentage (%)
Marital Status of the Participants		
Single	12	7.8
Married	122	79.7
Divorced	11	7.2
Widowed	7	4.6
Occupation of the Participants		
Student	46	30.1
Employed	27	17.7
Self-Employed	44	28.8
Unemployed	36	23.5
Place of Residence		
Urban	101	66.0
Rural	52	34.0

Marital Status of the Participants		
Single	12	7.8
Married	122	79.7
Divorced	11	7.2
Widowed	7	4.6
Place of Residence		
Urban	101	66.0
Rural	52	34.0

Table 1. presents the socio-demographic related statistics for the study participants. The minimum age of the participants was 19 years, while the maximum age was 54 years. The average (mean) age was 27.82 years with a standard deviation of 6.60.

Table 2. Vaccination Status and Factors Affecting Completion Among Participants

Item	Frequency	Percent
Vaccination		
Yes	88	57.5
No	54	35.3
Unsure	4	2.6
Dosage		
1 dose	18	11.8
2 doses	31	20.3
3 doses (complete series)	41	26.8
Unsure	9	5.9
Last Dosage		
< 1 year	33	21.6
1 - 5 years	31	20.3
> 5 years	26	17.0
Unsure	9	5.9
Dosage Location		
Government Hospital	48	31.4
Private Hospital	29	19.0
Community Health Center	19	12.4
School-based Program	3	2.0
Completion of Vaccination		
Yes	39	25.5
No	62	40.5
Unsure	5	3.3
Reason for not Completing		
Unavailability	3	2.0

Side Effects	5	3.3
Lack of Awareness	26	17.0
Cost	6	3.9
Forgetfulness	22	14.4
Family/Friends	2	1.3

Table 2. provided an overview of the vaccination status, dosage details, and reasons for incomplete vaccinations among the participants. More than half of the participants (57.5%) reported being vaccinated, while 35.3% were not, and 2.6% were unsure. This indicates a moderate level of vaccination uptake among the participants, though a substantial portion remains unvaccinated or uncertain of their vaccination status.

Among the vaccinated participants, 26.8% had completed the full series of three doses, while 20.3% had received two doses, and 11.8% had only received one dose. A small percentage (5.9%) were unsure of their dosage. The majority of participants did not complete the vaccination series, which is important for achieving full immunity.

Regarding the time since the last dose, 21.6% had received a vaccination within the last year, 20.3% within 1 to 5 years, and 17.0% more than 5 years ago. Again, 5.9% were unsure. This suggests that a large proportion of participants were either recently vaccinated or had received their last dose within the past 5 years, reflecting a recent or ongoing engagement with vaccination efforts.

The most common locations where participants received vaccinations were government hospitals (31.4%) and private hospitals (19.0%), followed by community health centers (12.4%). Only 2.0% received their doses through school-based programs, indicating that hospitals and health centers are the primary points of access for vaccinations in this population. Only 25.5% of the participants had completed the vaccination series, while 40.5% had not, and 3.3% were unsure. This suggests that a significant portion of the population did not complete the full vaccination regimen, which may hinder the effectiveness of immunization efforts. The reasons for not completing the vaccination series varied, with the most common being lack of awareness (17.0%) and forgetfulness (14.4%). Other factors included the cost of vaccination (3.9%), side effects (3.3%), and vaccine unavailability (2.0%). A small percentage (1.3%) were influenced by family or friends in their decision not to complete the series.

Table 3. Health Status and History of Hepatitis B Virus (HBV) Among Participants

Item	Frequency	Percentage (%)
Diagnosis		
Yes	31	20.3
No	114	74.5
Unsure	3	2.0
History of HBV		
Yes	38	24.8
No	94	61.4
Unsure	21	13.7

Table 3. provided information regarding the participants' diagnosis status and their history of Hepatitis B Virus (HBV). Out of the 150 participants, the majority (74.5%) had not received a diagnosis for the condition in question, while 20.3% had been diagnosed. A small percentage (2.0%) were unsure of their diagnosis. This

indicates that a significant portion of the participants either have not been diagnosed or are uncertain about their health status, which could affect their healthcare-seeking behavior and overall health management. Regarding the history of HBV, 24.8% of the participants reported having had HBV, while 61.4% reported not having the disease. Additionally, 13.7% were unsure of their HBV status. The fact that a noticeable proportion of participants are either unsure of their HBV status or have had the virus highlights potential gaps in health awareness or access to healthcare services.

Table 4 Factors Associated with HBV Prevalence and Vaccination Coverage

Factors	df	X ²	P
Age	46	50.379	.304
Marital Status	6	7.224	.301
Occupation	8	18.471	.018*
Residence	2	2.696	.260
History	4	12.053	.017*
Prior Test	2	39.518	.001*
Vaccination	4	2.875	.579
Dosage	6	7.466	.280
Last Dosage	6	10.091	.121
Dosage Location	6	6.374	.383
Vaccine Completion	4	3.490	.479
Other Reason	5	4.330	.503

Table 4. summarized the results of the chi-square tests analyzing the association between various demographic and health-related factors with vaccination completion among the participants. Each factor is evaluated using degrees of freedom (df), chi-square statistic (X²), and p-value to determine whether the association is statistically significant.

The results show that age ($p = .304$), marital status ($p = .301$), and place of residence ($p = .260$) do not have a statistically significant association with vaccination completion, indicating that these demographic factors do not strongly influence whether participants complete their vaccination. Similarly, factors such as the number of doses received ($p = .280$), time since last dose ($p = .121$), vaccination location ($p = .383$), and reasons for not completing vaccination ($p = .503$) were also found to have no significant association.

However, certain factors were found to have significant associations. Occupation ($p = .018$) showed a significant relationship, meaning participants' employment status may influence their likelihood of completing vaccinations. A history of Hepatitis B Virus (HBV) infection ($p = .017$) was also significantly associated with vaccination status, suggesting that participants with a prior history of HBV may be more likely to complete their vaccinations. Prior testing for HBV ($p = .001$) showed a highly significant association, indicating that participants who had been previously tested for HBV were more likely to complete their vaccination series.

Discussion

The findings from this study highlight a significant public health challenge regarding Hepatitis B Virus (HBV) prevention and control among pregnant women in Bauchi State. With an HBV prevalence of 21.38% among the study population, the burden of the disease remains alarmingly high. This prevalence aligns with the endemicity observed in Nigeria and other sub-Saharan African regions, where HBV remains a critical health concern. This was shown to be significantly high compared with other regions in Africa. In East Africa, the prevalence of HBV infection was 6.03% (Kaferoo et. al., 2021). The pooled prevalence of HBV infection among pregnant women in Nigeria was 6.49% (Olatunde et. al., 2021). The elevated rates among pregnant women pose dual risks—direct health implications for the mothers and vertical transmission to newborns, perpetuating the cycle of HBV infection.

Although the World Health Organization aims to eradicate viral hepatitis as a public health issue by 2030, yearly global fatalities from HBV are anticipated to rise by 39% from 2015 to 2030 if current conditions persist (WHO 2023).

Despite the availability of an effective HBV vaccine, this study revealed significant gaps in vaccination coverage. While 57.5% of participants reported receiving the HBV vaccine, only 25.5% completed the full three-dose series recommended for optimal protection. This incomplete vaccination coverage is troubling, as it undermines the effectiveness of HBV prevention efforts (Aroon et. al., 2017; Kaboore et. al., 2020). The low completion rate could be attributed to various barriers, including lack of awareness (17.0%), forgetfulness (14.4%), and accessibility issues. These findings align with previous studies (Mohanty et. al., 2020; Balaban et. al., 2021; Issa et. al., 2021), which identifies similar barriers to vaccination in resource-limited settings.

Interestingly, the chi-square analysis showed no significant association between vaccination coverage and HBV diagnosis ($p = 0.586$). This finding may suggest that incomplete or improperly administered vaccines might have contributed to inadequate immunity among the vaccinated group. A similar finding was reported by Mokhtari et. al., 2021. Additionally, some participants might have been exposed to the virus before receiving any vaccine doses, emphasizing the importance of timely vaccination, especially during early reproductive years.

Logistic regression analysis identified occupation and prior HBV testing as significant predictors of vaccination completion. Women employed in formal sectors were more likely to complete the vaccination series compared to those in informal or unemployed groups. This disparity highlights the role of socio-economic factors in healthcare access and utilization. Similarly, prior knowledge of HBV status through testing was positively associated with vaccine completion, underscoring the importance of increasing HBV awareness and promoting regular testing as entry points for preventive interventions.

The substantial proportion (13.7%) of participants unsure of their HBV status further complicates the situation. This lack of awareness limits early detection and treatment opportunities, thereby increasing the risk of complications such as chronic liver disease and neonatal HBV transmission. Notably, vertical transmission accounts for a significant proportion of chronic HBV cases globally, underscoring the critical role of maternal health interventions. The high prevalence of HBV among pregnant women in this study highlights an urgent need for enhanced antenatal care programs that integrate HBV screening, vaccination, and treatment.

Recommendations

Addressing these gaps requires a multi-pronged approach. Public health campaigns should prioritize raising awareness about HBV and the importance of completing vaccination schedules. Community-based initiatives, such as peer education and mobile vaccination units, can improve accessibility and uptake, particularly in rural and underserved areas. Integrating HBV vaccination into routine antenatal care services could ensure timely administration and completion of the vaccine series. Furthermore, robust policies to subsidize or eliminate vaccine costs for pregnant women may address economic barriers.

Conclusion

This study underscores the critical need to strengthen HBV prevention and control measures among pregnant women in Bauchi State. The high prevalence, coupled with suboptimal vaccination rates, highlights significant public health challenges. Strategic interventions, including increased awareness, improved vaccination access, and integration of HBV services into antenatal care, are essential to mitigate the burden of HBV and its associated complications. These efforts will not only protect maternal health but also reduce the risk of neonatal HBV infections, contributing to the long-term goal of HBV elimination.

Declarations

The authors declared no conflict of interest

Ethical Approval and Consent to Participate

Ethical approval for the study was granted by the Research and Ethical Committee, Faculty of Basic Medical Sciences, Sa'adu Zungur University, Bauchi State, under approval number MOH/GEN/S/1409/1. Prior to data collection, informed written consent was secured from each pregnant woman who consented to participate. For participants aged 15 to under 18 years, all were legally married and considered emancipated minors under state law, allowing them to provide independent consent without the need for parental or guardian approval. The ethics committee recognized these individuals as capable of consenting on their own due to their marital status. Confidentiality was rigorously upheld, with all participant identifiers securely stored.

Participants were informed of their Hepatitis B Surface Antigen (HBsAg) status and were advised on any necessary follow-up actions. Additionally, the study outcomes were shared with the eight participating health facilities, the Local Primary Health Care Development Authority, and the Bauchi State Ministry of Health for appropriate action.

References

1. Kafeero HM, Ndagire D, Ocamo P, Kudamba A, Walusansa A, Sendagire H. Prevalence and predictors of hepatitis B virus (HBV) infection in east Africa: evidence from a systematic review and meta-analysis of epidemiological studies published from 2005 to 2020. *Archives of Public Health*. 2021;79(1):167.
2. Olakunde BO, Adeyinka DA, Olakunde OA, Uthman OA, Bada FO, Nartey YA, et al. A systematic review and meta-analysis of the prevalence of hepatitis B virus infection among pregnant women in Nigeria. *PLoS ONE*. 2021;16(10): e0259218.
3. Kabore, Hyacinte J et al. "Effects of Decreased Immunization Coverage for Hepatitis B Virus Caused by COVID-19 in World Health Organization Western Pacific and African Regions, 2020." *Emerging infectious diseases* vol. 28,13 (2022): S217-S224. doi:10.3201/eid2813.212300
4. Aaron, D., Nagu, T.J., Rwegasha, J. et al. Hepatitis B vaccination coverage among healthcare workers at national hospital in Tanzania: how much, who and why?. *BMC Infect Dis* **17**, 786 (2017).

<https://doi.org/10.1186/s12879-017-2893-8>

5. Mohanty, Parimala et al. "Vaccination against Hepatitis B: A Scoping Review." *Asian Pacific journal of cancer prevention : APJCP* vol. 21,12 3453-3459. 1 Dec. 2020, doi:10.31557/APJCP.2020.21.12.3453
6. Balaban, H. Yasemin et al. "Lack of awareness of Hepatitis B screening and vaccination in high-risk groups." *Turkish journal of medical sciences* vol. 51,3 1229-1233. 28 Jun. 2021, doi:10.3906/sag-2008-18
7. Issa, A., Ayoola, Y.A., Abdulkadir, M.B. et al. Hepatitis B vaccination status among health workers in Nigeria: a nationwide survey between January to June 2021. *Arch Public Health* **81**, 123 (2023). <https://doi.org/10.1186/s13690-023-01142-y>
8. Mokhtari, Ali Mohammad et al. "Association of Routine Hepatitis B Vaccination and Other Effective Factors with Hepatitis B Virus Infection: 25 Years Since the Introduction of National Hepatitis B Vaccination in Iran." *Iranian journal of medical sciences* vol. 46,2 (2021): 93-102. doi:10.30476/ijms.2019.83112.1199