Tanzanian Journal of Multidisciplinary Studies
Vol. 2. No. 1 (2024), pp:20-37

Online ISSN: *3057 - 3149*
Tanzanian Journal of Multidisciplinary Studies (TzJMS)

Strategies for Shielding the Future: Impact of Preventive Strategies on the Prevalence of Hepatitis B among Pregnant Women in Gombe State

Dr. Tensaba Andes Akafa,[1] Dr. Ismaila Yunusa Yuguda,[2] Dr. Gideon Bulus Chiroma[3,] Dr. Ruth Musa Yahaya[4,] Dr. Gloria Omonefe Oladele,[5] Sylvia Adanma Ezenwa-Ahanene,[6] & Dr. Kingsley Iyoko Iseko.[7]

[1]Federal University, Wukari, Taraba State, Nigeria.
Corresponding author. Email:
akafaktensaba@gmail.com
[2]Department of Public Health, Gombe State University, Nigeria.
[3]Department of Public Health, Gombe State, University, Nigeria.
[4]State Aids STI Control Program, Gombe State.
[5]Federal Medical Centre, Bida, Niger State.
[6]Rivers State, Nigeria.
[7]Limi Hospital, Abuja, Nigeria.

Abstract:
This study explored the socioeconomic factors and awareness of preventive strategies among pregnant women concerning Hepatitis B Virus (HBV) management and mother-to-child transmission. A total of 264 women were surveyed, revealing a young demographic with ages principally between 25-34 years (35.7%) and a substantial unemployment rate (58.2%). Educational attainment varied, with 37.4% having completed secondary education, while a significant proportion lacked formal education. Antenatal care attendance was low; 66.5% of participants attended only one visit, and 50% booked during the second trimester (13-27 weeks), raising concerns about the adequacy of prenatal care. Alarmingly, 92.3% of respondents reported no Hepatitis B vaccination, indicating critical gaps in health awareness and preventive measures. Despite recognizing that access to antenatal care services is perceived as easy (71.8%), knowledge gaps persisted, especially regarding antiviral therapy necessity for HBV-positive pregnant women (63.2% disagreed). The study highlights a significant association between preventive strategies and the prevalence of HBV cases (Chi-square = 86.92, $p < 0.00001$), emphasizing the need for targeted educational interventions. Given that 83.79% of respondents showed good adherence to preventive measures, there remains an urgent need for enhanced awareness and resources to effectively manage and mitigate the risks of Hepatitis B transmission to newborns. Overall, the findings advocate for improved health education, resource allocation, and targeted interventions to address prevailing gaps in knowledge and access, ultimately fostering better health outcomes for mothers and newborns in this high-risk population. Enhanced outreach programs and community health initiatives could play a critical role in bridging these gaps and improving Hepatitis B management strategies.

Keywords: Hepatitis B, preventive strategies, pregnant women, Gombe state.

Suggested Citation: T. A. Akafa, I. Y. Yuguda, G. B. Chiroma, R. M. Yahaya, G. O. Oladele, S. A. Ezenwa-Ahanene & K. I. Iseko (2024), 'Strategies for Shielding the Future: Impact of Preventive Strategies on the Prevalence of Hepatitis B among Pregnant Women in Gombe State,' *TzJMS*. Vol. 2.No. 1. pp. 20-37.

Peer Reviewed

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

KIUT KAMPALA INTERNATIONAL UNIVERSITY IN TANZANIA
EXPLORING THE HEIGHTS

1. INTRODUCTION

The World Health Organization (WHO) noted that viral hepatitis is a bigger threat to Africa than HIV/AIDS, malaria, and tuberculosis because of the high number of deaths from hepatitis each year yet lesser attention is paid to it where about 30% of the nearly 300 million people with chronic hepatitis B live in Africa.[1] Therefore, it is very important to find new ways to mitigate the spread of hepatitis B on the continent. Hepatitis B virus poses severe health risks, including chronic liver disease, liver cirrhosis, and hepatocellular carcinoma. Significantly, one of the critical transmission routes of HBV is from mother to child during the perinatal period. Without appropriate preventive measures, the risk of vertical transmission can be as high as 90% among chronic HBV carriers.[1,2]

Most infections in infants aged 6-12 months come from mother-to-child transmission of hepatitis B. Mothers who do not receive proper vaccinations or treatment have a high risk of passing the virus to their babies, with transmission rates of 70%-90% for HBeAg-positive mothers, 25% for HBeAg-negative/HBeAb-negative mothers, and 12% for HBeAg-negative/anti-HBe-positive mothers. Using immunoprophylaxis and antiviral treatment during the third trimester has been effective in reducing the risk of transmission at birth, indicating that most infections happen around the time of delivery, while intrauterine transmission occurs in less than 15% of cases.[3,4]

Pregnant women, especially in low- and middle-income countries like Nigeria, are often vulnerable due to socioeconomic factors that limit access to healthcare and education on infectious diseases. Studies indicate that socio-economic status significantly influences the uptake of antenatal care services, which are essential for managing both maternal and fetal health. In many regions, high unemployment rates and low educational attainment correlate with limited health choices and inadequate preventive care practices.[5] For example, maternal education is directly associated with improved health-seeking behaviors, which are crucial for effective disease management during pregnancy.[6]

Despite recognizing the importance of antenatal care, many women do not attend these crucial visits in a timely manner. The ideal booking period for antenatal care is

during the first trimester (before 12 weeks gestation), yet national surveys have shown that a significant number of women books much later, with many making only a single visit throughout their pregnancy period.[7]This delay can hinder timely interventions, such as screening and vaccination against HBV, ultimately endangering both maternal and child health.[8]

Moreover, awareness of HBV and its implications for pregnancy is alarmingly low. Data suggest that many pregnant women lack fundamental knowledge about the necessity of screening and vaccination for HBV, further complicating the prevention of mother-to-child transmission (MCT).[9] Given that health education plays a crucial role in enhancing awareness and encouraging preventive strategies, it is essential to assess the existing knowledge gaps within this demographic cohort.[10] This study investigates the demographic characteristics, employment status, educational backgrounds, awareness and impact of preventive strategies concerning HBV among pregnant women in State Specialist Hospital Gombe, Nigeria. Results from this inquiry are aimed at identifying critical gaps and informing targeted public health interventions.

1.1 General Aim

The aim of this paper is to evaluate the knowledge, attitudes, adherence to, and impact of preventive strategies on mother-to-child transmission of Hepatitis B Virus (HBV) among pregnant women attending antenatal care, and to identify educational gaps and barriers to effective prevention.

1.2 Specific Objectives - The objectives of the study are:

a. To evaluate the overall knowledge and awareness of Hepatitis B and its transmission among pregnant women attending antenatal care.
b. To determine the proportion of pregnant women demonstrating good versus poor adherence to recommended preventive strategies against MTCT of HBV, based on scoring (1-5).
c. Investigate the factors associated with respondents' scores on preventive measures, exploring their awareness of and access to preventive services, and,

d. To propose specific educational and resource-based interventions aimed at enhancing understanding and access to preventive measures for all pregnant women based on the study's findings.

2. METHODOLOGY

2.1 Study Area

The study was conducted at State Specialist Hospital Gombe, a suitable facility due to its large population accessing baseline HBV screening and other laboratory services. It is a recipient referral center in the state with a diverse mix of healthcare personnel, including Obstetricians, Family Physicians, and Pediatricians who manage mothers and neonates based on HBsAg test results.

2.2 Study Population

The study included pregnant women receiving antenatal care, labor and delivery services at the hospital. A total of 265 women aged 18 to 45 years from different socioeconomic classes were recruited.

2.3 Study Design

A descriptive epidemiological study design was utilized, incorporating both quantitative and qualitative research methods. Quantitative methods involved laboratory-based screening for hepatitis B using PROMED HBsAg test kits, while qualitative data were collected through semi-structured, pre-tested, interviewer-aided questionnaires to assess management options and preventive strategies.

2.4 Inclusion Criteria

Pregnant women aged 18 years and above, attending the antenatal clinic and labor ward at State Specialist Hospital Gombe. Pregnant women who consented to participate in the study were included in the survey.

2.5 Exclusion Criteria

Clients co-infected with Hepatitis B virus and HIV were excluded from the study.

2.6 Sample Size Estimation

The sample size was calculated based on the formula for cross-sectional study designs, following the guidelines from Peter et al., 2019: [11]

$$n = \frac{z^2\, p(1-p)}{d^2}$$

$n = sample\ size$

$z = level\ of\ confidence (1.96)$

$p = expected\ prevalcence\ (0.195)$[11]

$d = level\ of\ precision\ (0.05)$

$$n = \frac{(1.96)^2\ 0.195(1-0.195)}{(0.05)^2}$$

$$n = \frac{3.8416\ x\ 0.1570)}{0.0025}$$

$n = 241,\ \ 10\%\ attrition = 24\ , N = 265$

2.7 Sampling Technique

A multistage sampling method was used to recruit the 265 pregnant women. Initially, convenient sampling was used to select the study facility. In the second stage, systematic random sampling was applied, with a sample interval of five (5) based on an average monthly antenatal care attendance of 627 clients. Written informed consent was obtained, and participants completed the questionnaire before undergoing laboratory tests at the prevention of mother-to-child transmission (PMTCT) testing unit.

2.8 Pretesting of Questionnaire

The questionnaire was pretested on 10% of the sample size at General Hospital Kaltungo, located 74 km from the study area, and revised to ensure internal validity.

2.9 Research Instrument / Administration of Questionnaire

A self-designed, pretested semi-structured questionnaire was employed to collect data on demographics, management options and horizontal transmission of HBV preventive strategies. Three trained research assistants, including the ANC PMTCT coordinator (who were all proficient in English language and also served as interpreters in the local language to some respondents) facilitated the administration of the questionnaire. The questionnaire comprised four sections: socio-demographic details, laboratory results, management of HBV infection in pregnancy, and attitudes towards HBV prevention strategies.

2.10 Methods of Detection, Diagnosis and Screening of HBV Infection among the Participants: Principle of the Test

Three hundred (300) pieces of PROMED Hepatitis B surface antigen test strip was supplied to the PMTCT Laboratory Unit in the ANC Department of State Specialist Hospital, Gombe by the researchers which was used for the period of the study. This Hepatitis B Rapid test kit is a qualitative, lateral immunoassay for the detection of HBsAg in serum or plasma. The membrane is pre-coated with anti-HBsAg antibodies on the test line region of the strip. During testing, the serum or plasma specimen reacts with the particle coated with anti-HBsAg antibody. The mixture migrates upward on the membrane chromatographically by capillary action to react with the anti-HBsAg antibodies on the membrane and generate a red line. The presence of a red line in the test region indicates a positive result, while its absence indicates a negative result. To serve as a procedural control, a red line will always appear on the control line region indicating that the proper volume of specimen has been added and membrane wicking has occurred.

2.11 Collection of Secondary Data from Medical Records

Patient case records for Hepatitis B were accessed using hospital numbers. Details of management options provided were assessed and documented accordingly.

2.12 Ethical Considerations

Ethical clearance was obtained from both the University Research Committee and the Gombe State Ministry of Health Ethics Committee, with approval from the Medical Director of State Specialist Hospital. Written informed consent was collected from eligible pregnant women prior to enrollment, ensuring confidentiality throughout and after the study. The findings are used strictly for academic and policy purposes.

2.13 Limitations

The study is limited by the exclusion of clients co-infected with HIV, which may affect the generalization of findings to a broader population. The reliance on self-reported data may have introduced bias. The pretesting was conducted at a different facility, which might not fully represent the study population's characteristics.

2.14 Results

Table 1: Sociodemographic Profile

Item	Frequency	Percent
AGE		
18-24	88	24.2
25-34	130	35.7
35-44	46	12.6
44 and Above	0	0
EMPLOYMENT STATUS		
Employed	52	14.3%
Unemployed	212	58.2%
EDUCATIONAL LEVEL		
Informal	8	2.2%
None	31	8.5%
Primary	15	4.1%
Secondary	136	37.4%
Tertiary	74	20.3%
NUMBER OF PREVIOUS PREGNANCIES (Gravidity)		
>3	97	26.6%
1	78	21.4%
2	49	13.5%
3	40	11.0%
NUMBER OF ANTENATAL CARE VISITS		
>4	3	0.8%
1	242	66.5%
2	11	3.0%
3	6	1.6%
4	2	0.5%
GESTATIONAL AGE AT BOOKING (in weeks)		
<12	56	15.4%
13-27	182	50.0%
28-40	26	7.1%
AVERAGE INCOME (In Naira/Month)		
<30,000	243	66.8%
>70,000	3	0.8%
30,000 - 50,000	15	4.1%
50,000 - 70,000	3	0.8%

(a) Age Distribution: The largest group of respondents was aged 25-34 years (35.7%), followed by 18-24 years (24.2%). No respondents are aged 44 and above, indicating a younger demographic predominantly in their prime childbearing years.

(b) Employment Status: A significant majority (58.2%) are unemployed, with only 14.3% employed, reflecting a low-income population that may face challenges in accessing healthcare.

(c) Educational Background: Most participants have completed secondary education (37.4%), while 20.3% have tertiary education. A notable portion has no formal education (8.5%) or only informal schooling (2.2%), potentially affecting their health information access.

(d) Gravidity: 26.6% of women reported having more than three pregnancies, with others having one (21.4%), two (13.5%), or three (11.0%), indicating varied reproductive experiences.

(e) Antenatal Care Visits: A majority (66.5%) attended only one antenatal visit, with very few attending more than four (0.8%). This raises concerns about adequate prenatal care.

(f) Gestational Age at Booking: Half of the women (50.0%) booked their antenatal care between 13-27 weeks, with 15.4% booking before 12 weeks and only 7.1% booking later (28-40 weeks), which may impact pregnancy management.

(g) Income Distribution: Most respondents (66.8%) earn less than 30,000 Naira per month, highlighting economic challenges, with very few earning above 30,000 Naira. This is obtained from Table 1 above.

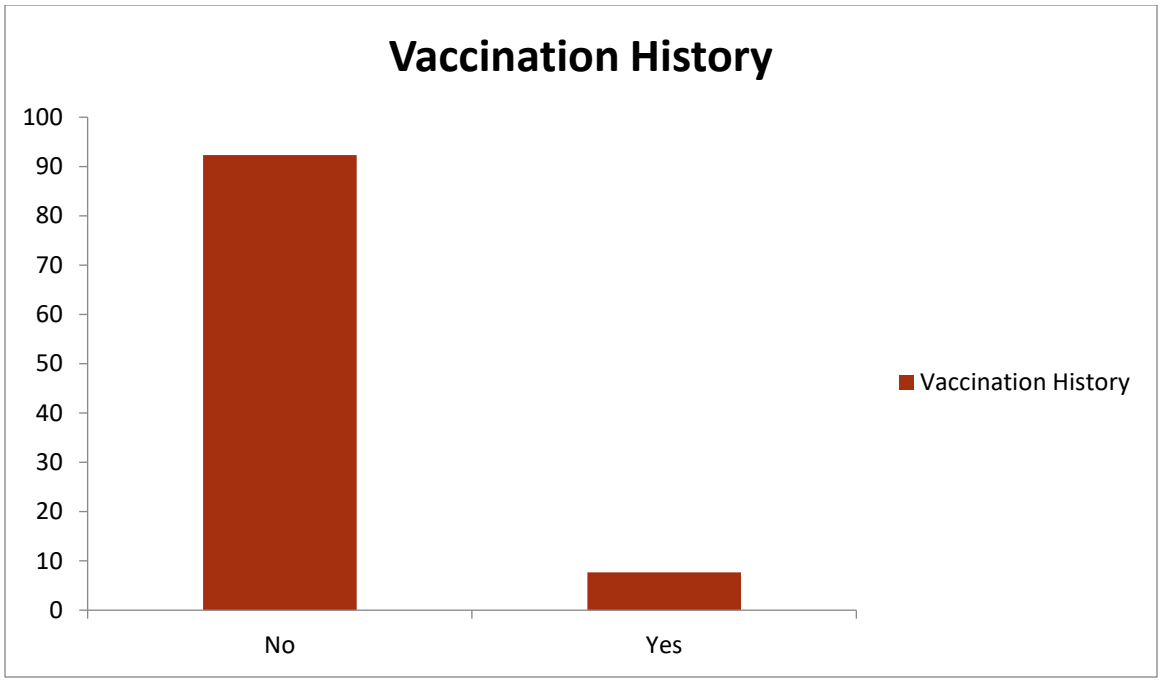

Figure 1: Vaccination History against Hepatitis B Virus

A significant majority (92.3%) of women have not been vaccinated against Hepatitis B, indicating poor awareness and prevention measures, while only 7.7% have a vaccination history. Chi-square statistic without correction: 86.54, p-value: < 0.00001 (significant at $p < .05$). Chi-square statistic with Yates correction: 80.4983, p-value: < 0.00001 (significant at $p < .05$). Figure 1. These results highlight a critical need for improved awareness and vaccination efforts.

Table 2: Preventive Strategies against Mother-To-Child Transmission of Hepatitis B Virus among Pregnant Women Attending ANC

Question	Strongly Agree F(%)	Agree F(%)	Neutral F(%)	Disagree F(%)	Strongly Disagree F(%)
I have easy access to antenatal care services for Hepatitis B prevention	74 (28.7%)	185 (71.8%)	3 (1.2%)	2 (0.8%)	0 (0.0%)
Pregnant women should be screened for HBV infection	73 (28.3%)	185 (71.8%)	5 (1.9%)	1 (0.4%)	0 (0.0%)

If you test positive for Hepatitis B virus infection, it is important to commence antiviral therapy during pregnancy to prevent mother-to-child transmission of HBV	25 (9.8%)	65 (25.5%)	10 (3.9%)	161 (63.2%)	3 (1.2%)
I know the availability and purpose of Hepatitis B Immunoglobulin (HBIG) for newborns born to mothers with Hepatitis B	74 (28.7%)	181 (70.2%)	8 (3.1%)	1 (0.4%)	0 (0.0%)
If you have been identified as Hepatitis B positive, your newborn should receive Hepatitis B Immunoglobulin (HBIG) within 12 hours of birth for maximum effectiveness	71 (27.7%)	186 (72.3%)	5 (1.9%)	1 (0.4%)	1 (0.4%)
Newborns need to receive a birth dose of the Hepatitis B vaccine within 24 hours of delivery to prevent perinatal Hepatitis B transmission	96 (37.4%)	165 (64.3%)	1 (0.4%)	2 (0.8%)	0 (0.0%)
Infants need to receive 2 to 3 additional doses of the hepatitis B vaccine at 1-2 and 6 months	93 (36.2%)	167 (64.0%)	2 (0.8%)	1 (0.4%)	1 (0.4%)
Breastfeeding is generally safe for infants born to HBV-positive mothers, especially if the infant has received the HBV vaccine series	89 (35.1%)	170 (66.4%)	3 (1.2%)	1 (0.4%)	1 (0.4%)

Infants born to HBsAg-positive mothers should undergo testing for HBsAg and HBsAb between 9 and 18 months of age to determine their immunity against the infection	87 (34.1%)	170 (66.4%)	4 (1.6%)	1 (0.4%)	2 (0.8%)
Practicing safe sex by using condoms can reduce the risk of sexual transmission of HBV	98 (38.3%)	163 (63.3%)	1 (0.4%)	1 (0.4%)	1 (0.4%)
Limiting the number of sexual partners and avoiding high-risk sexual behaviors can also lower the risk of HBV infection	90 (35.4%)	164 (64.1%)	6 (2.3%)	2 (0.8%)	2 (0.8%)
Individuals who have been exposed to HBV through needlestick injuries, sexual contact with an HBV-infected person, or other routes should receive timely post-exposure prophylaxis (PEP) with HBIG and/or the HBV vaccine to prevent infection	92 (36.0%)	165 (64.3%)	3 (1.2%)	3 (1.2%)	1 (0.4%)

(a) Access to Antenatal Care: A majority of respondents perceive access to antenatal care services for Hepatitis B prevention as easy, with 71.8% agreeing and 28.7% strongly agreeing.

(b) Knowledge Gaps: There is a significant lack of awareness regarding Hepatitis B management, as 63.2% disagree on the necessity of antiviral therapy for pregnant women who test positive.

(c) Newborn Care Awareness: Most respondents (72.3%) agree that newborns should receive HBIG within 12 hours of birth, but awareness of its availability and purpose is slightly lower at 70.2%. Table 2.

Table 3: Relationship between Prevalence and Prevention Strategies

PREVENTIVE STRATEGIES SCORE	Prevalence				
	Reactive	Non-Reactive	Total	X^2	P-Value
Good	1	220	221	86.540	**0.00001**
Poor	17	26	43	5	**
Total	18	246	264		

There is a significant relationship between the quality of preventive strategies and the prevalence of reactive versus non-reactive cases.

(a) Good Preventive Strategies: One reactive case but 220 non-reactive cases were recorded.

(b) Poor Preventive Strategies: 17 reactive cases and 26 non-reactive cases. The chi-square statistic is 86.54 with a p-value of 0.00001, indicating that effective preventive measures significantly reduce reactive cases and increase non-reactive cases, demonstrating their importance in managing prevalence.

The chi-square statistic with Yates correction is 80.4983. The p-value is < 0.00001. Significant at $p < .05$. Table 3.

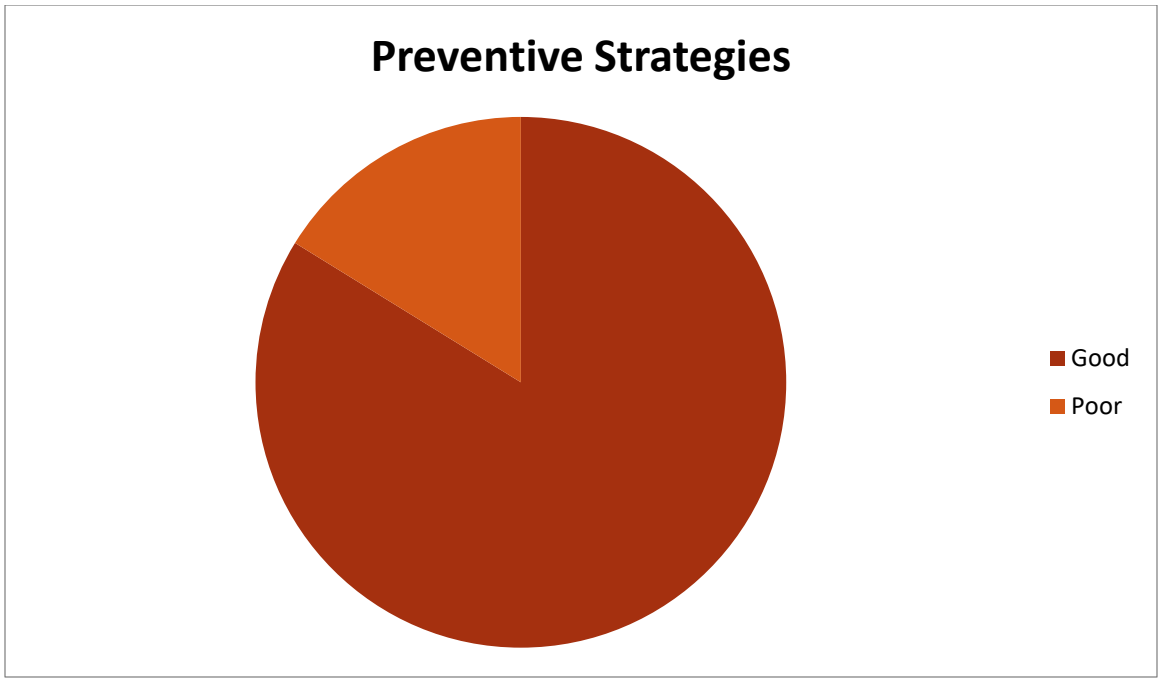

Figure 2: Preventive Strategies against Mother-to-Child Transmission of Hepatitis B Virus.

This figure displays the effectiveness of preventive strategies against mother-to-child transmission (MTCT) of Hepatitis B Virus (HBV) among pregnant women attending antenatal care (ANC). Using a scoring system from 1 to 5, those who scored 4-5 were considered to have good preventive measures while poor preventive measures were reflected for those with scores of three (3) and below; 83.71% of respondents scored in the "good" category, demonstrating adherence to recommended practices. Conversely, 16.29% fell into the "poor" category, suggesting that there is still a significant need for improved education and access to preventive resources. This finding highlights the importance of addressing the gaps for the minority of women with lower scores. Targeted educational interventions, enhanced counseling services, and improved access to relevant resources could help increase awareness and implementation of effective preventive measures, thereby reducing the risk of HBV transmission to newborns.

3. DISCUSSION

The findings of this study highlight critical areas in the management and prevention of Hepatitis B virus (HBV) transmission among pregnant women at State Specialist Hospital Gombe. The data show substantial accessibility to antenatal care services for HBV

prevention and underscore significant gaps in knowledge and understanding regarding antiviral therapy and newborn treatment.[3,] The results indicate that a significant majority of respondents in our study perceive access to antenatal care for Hepatitis B prevention as good, with 99% agreeing they have easy access to antenatal care services for Hepatitis B prevention. This perceived level of accessibility implies that the current healthcare infrastructure is adequate to address the needs of pregnant women for HBV screening and management. However, challenges remain, as many potential clients face barriers that prevent them from utilizing these services effectively.[5,8] Also, while access is important, it is essential to evaluate the quality and comprehensiveness of care provided in these services. The delivery of effective healthcare not only requires availability but also necessitates that clients receive appropriate information and support from healthcare providers. This is also similar to a study carried out by Fagbamigbe et al in 2015 which revealed that the top three barriers were "affording transportation," "distance to ANC service providers," and "lack of transport," which accounted for 44.3% of all obstacles.[3,9]

Despite the perceived accessibility of antenatal services, a significant gap in knowledge and understanding of Hepatitis B management was uncovered. Notably, 63.2% of respondents lacked knowledge about the necessity of antiviral therapy if a pregnant woman tests positive for HBV. This highlights an urgent need for targeted educational initiatives aimed at both healthcare professionals and expectant mothers. Enhancing knowledge on antiviral therapy is crucial as it plays a vital role in reducing viral load and, consequently, the risk of mother-to-child transmission.[10,12]

Furthermore, although most respondents recognized the need for administering Hepatitis B Immunoglobulin (HBIG) within 12 hours of birth, only 70% were aware of its availability and purpose. This discrepancy between recognition of the treatment's necessity and actual knowledge about its implementation reflects a significant barrier that can undermine the effectiveness of preventive strategies.[13,14] Educational campaigns should focus not only on the benefits of such treatments but also on the protocols for timely administration to optimize outcomes.[15]

The overall positive adherence rate of over 80% among respondents achieving scores categorized as "good" indicates that most pregnant women are following recommended practices for preventing mother-to-child transmission of HBV. This statistic is promising and suggests a proactive approach by the majority of expectant mothers. However, about 20% of women who scored poorly demonstrates that there is still a segment of the population lacking sufficient knowledge or support to effectively implement HBV preventive measures.[13] Addressing the needs of this subgroup will be crucial for improving overall public health outcomes related to HBV transmission. Identifying specific barriers these women face—be it social stigma, logistic issues in accessing care, or insufficient information—will enable targeted interventions. Tailoring educational materials and support systems to address these needs may help to reduce disparities in adherence to preventive guidelines.[15]

The implications of these findings are profound for practice and policy. Comprehensive educational interventions should be prioritized to increase awareness of antiviral therapy and its critical role in HBV management during pregnancy. Programs should be designed to reach both healthcare providers, ensuring they are well-informed and capable of educating their clients, and the pregnant women themselves, enabling informed decision-making regarding their health and their newborns' health. Additionally, enhancing the accessibility and understanding of antiviral therapies is crucial. Efforts must include making treatment options more readily available and ensuring that expectant mothers understand not just the necessity but also the logistics of accessing these critical services.[1,2]

3.1 Recommendations for Future Research

Future research should emphasize exploring the dynamics behind the low scores of some women related to preventive measures against HBV. Qualitative studies could provide deeper insights into the personal, societal, and systemic barriers experienced by these women. Understanding these factors will be essential for crafting effective interventions and support systems.

3.2 Conclusion

Overall, while there is a foundation of good practices regarding the prevention of mother-to-child transmission of Hepatitis B in Gombe State, focused educational initiatives and improved access to antiviral therapies are essential to bridge existing gaps and enhance care. While the findings indicate positive trends in access to antenatal care, and adherence to preventive strategies, the obvious knowledge gaps necessitate concentrating our efforts in education and support. This multifaceted approach will ultimately mitigate the risk of mother-to-child transmission of HBV and improve health outcomes for both mothers and their infants.

References

1. World Health Organization. Guidelines for the prevention, diagnosis, care and treatment for people with chronic hepatitis B infection. (2024).

2. World Health Organization. Prevention of mother-to-child transmission of hepatitis B virus: Guidelines on antiviral prophylaxis in pregnancy. (2020).

3. Fagbamigbe AF, Idemudia ES. Barriers to antenatal care use in Nigeria: evidences from non-users and implications for maternal health programming. BMC Pregnancy Childbirth. 2015;15:95.doi:10.1186/s12884-015-0527-y.

4. Hang Pham TT, Le TX, Nguyen DT, Luu CM, Truong BD, Tran PD, Toy M, So S. Knowledge, attitudes and practices of hepatitis B prevention and immunization of pregnant women and mothers in northern Vietnam. PLoS One. 2019 10;14(4):e0208154. doi: 10.1371/journal.pone.0208154.

5. Eleje GU, Akaba GO, Mbachu II, Rabiu A, Loto OM, Usman HA, Fiebai PO, Chukwuanukwu RC, Joe-Ikechebelu NN, Nwankwo CH, Kalu SO. Pregnant women's hepatitis B vaccination coverage in Nigeria: a national pilot cross-sectional study. Therapeutic advances in vaccines and immunotherapy.2021;9:25151355211032595.

6. Saraceni C, Birk J. A review of hepatitis B virus and hepatitis C virus immunopathogenesis. Journal of Clinical and Translational Hepatology.2021;9(3):409.

7. Gebrecherkos T, Girmay G, Lemma M, Negash M. Knowledge, Attitude, and Practice towards Hepatitis B Virus among Pregnant Women Attending Antenatal Care at the University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia. Int J Hepatol. 2020;2020:5617603. doi:10.1155/2020/5617603

8. Dagnew M, Million Y, Destaw B, Adefris M, Moges F, Tiruneh M. Knowledge, Attitude, and Associated Factors Towards Vertical Transmission of Hepatitis B Virus Among

Pregnant Women Attending Antenatal Care in Tertiary Hospitals in Amhara Region, Northwest Ethiopia: A Cross-Sectional Study. Int J Womens Health. 2020 Oct 16;12:859-868. doi: 10.2147/IJWH.S273560.

9. Ade-Ojo IP, Babatola AO, Ojo TO, et al. Knowledge and Willingness to Utilize Hepatitis B Preventive Measures among Pregnant Women in Ado-Ekiti, Southwest, Nigeria. Interdiscip Perspect Infect Dis. 2023;2023:9168038. doi:10.1155/2023/9168038

10. Odelola OI, Akadri AA, Shorunmu TO. Hepatitis B virus infection: knowledge of antenatal attendees in a tertiary hospital. Nigerian J of Medicine.2020;29(1):24-8.

11. Peter Asaga, M., Adamu Chipago, S., & Philomena Ehi, A. (2019). High Prevalence of Hepatitis B Virus Infection among Pregnant Women Attending Antenatal Care in Central Nigeria. Journal of Infectious Diseases and Epidemiology, 5(1). https://doi.org/10.23937/2474-3658/1510068

12. Kwadzokpui PK, Akorsu EE, Abaka-Yawson A, Quarshie SS, Amankwah SA, Tawiah PA. Prevalence and Knowledge of Hepatitis B Virus Infection among Pregnant Women in the Ningo-Prampram District, Ghana. International journal of hepatology. 2020;2020(1):7965146.

13. Lanyo TN, Adjei CA, Ani-Amponsah M. Informational and Practical Needs of Expectant Mothers with Chronic Hepatitis B in Ghana. SAGE Open Nursing. 2024;10:23779608241255183.Stevens CE, Toy P, Kamili S, Taylor PE, Tong MJ, Xia GL, Vyas GN. Eradicating hepatitis B virus: the critical role of preventing perinatal transmission. Biologicals. 2017 Nov 1;50:3-19.