Original Research Article

Prevalence of Hepatitis B infection among Pregnant Women attending Antenatal Care in Makurdi, Benue State, Nigeria. A 6-year Review of Tertiary Hospital Records.

Abstract

Background: Hepatitis B virus is the most common major hepatic infection. Hepatitis B virus disease is a potentially life-threatening liver infection and a major global health problem. It causes chronic infection and puts people at high risk of death from cirrhosis and liver cancer. WHO estimated 257 million people are living with hepatitis B virus (HBV) infection and in 2015 alone HBV resulted in to 887,000 deaths globally. During pregnancy, the hepatitis B virus has an elevated rate of vertical transmission. Hepatitis B virus (HBV) infection remains a major public health issue worldwide. Moreover, its prevalence varies significantly in different geographic areas of Nigeria. Fetal hepatitis acquired during pregnancy can lead to an impairment of cognitive and physical development in the future lives of children

Objective: This study was to assess the prevalence of the hepatitis B virus infection among pregnant women receiving antenatal care at public health facility in Makurdi, Benue State Nigeria.

Methods: This was a retrospective cross-sectional study, where secondary data of pregnant women who accessed antenatal services at the Department of Obstetrics and Gynaecology of Federal Medical Centre, Makurdi from January, 2016 to
December 2020 were retrieved from the hospital's database. In total, 21857 pregnant women booked and received antenatal care at the facility under the years of review. All pregnant women were screened for serum HBV markers.

Results: The prevalence rates of hepatitis B surface antigen (HBsAg) and hepatitisB surface antibody positivity among the participants were 13.66% (*n* = 2417). The overall prevalence rates of susceptibility to infection, HBV immunity, previous/occult infection, inactive HBsAg carrier, and active infection were 43.44%, 36.15%, 14.91%, 4.08%, and 0.42%, respectively. According to age distribution, the prevalence of HBsAg in pregnant women increased with age, with the highest positivity rate in participants aged >30 years, followed by those aged 25–29 years. Meanwhile, pregnant women aged <20 years had the lowest rates of HBV infection. Of 849 pregnant women that had HIV in pregnancy, 50.53% (429) were positive to HBsAg serological testing (Table 4) with 11.43% of them having active infection as showed in Table 5.

Conclusion: The HBV infection rate remains high among pregnant women attending antenatal clinics at the Department of Obstetrics and Gynaecology of Federal Medical Centre (FMC), Makurdi. To prevent vertical transmission, cautious surveillance of maternal HBV infection profile should be integrated in antenatal care package for pregnant women accessing antenatal care in the studied centre and Nigeria in general.

Keywords: Prevalence, HBV, Pregnant Women, Antenatal Care, Makurdi

Introduction

Hepatitis B virus (HBV) infection remains a major public health issue posing a substantial socioeconomic burden.Hepatitis B virus disease is a potentially life-threatening liver infection and a major global health problem. Hepatitis B infection is associated with the risk of death arising from cirrhosis, liver and non-liver cancers[1]. Transmission of Hepatitis B virus (HBV) results from exposure to contaminated blood or body fluids, unprotected sexual contact with an infected person, blood transfusion, use of contaminated needles, syringes, and sharps as well as vertical transmission from mother to child. There is risk of HBV transmission to the newborn delivered by a hepatitis B surface antigen (HBsAg)-positive woman. This risk is amplified with positivity of hepatitis B envelope antigen (HBeAg)[2]. Globally, WHO estimates that in 2015, 257 million persons, or 3.5% of the population, were living with chronic HBV infection. The African and Western Pacific regions accounted for 68% of those infected. In Nigeria, the National Program on Immunization (NPI) which targets the infants, started in 1998. Hepatitis B vaccine coverage for infants

were 50.6% for first dose, 45.6% second dose and 38.2% for third dose[3]. Globally, approximately 2 billion people have serologic evidence of previous or current infection with HBV, and more than 257 million have chronic HBV infection.[4]Importantly, patients with HBV who are chronic carriers are at higher risk of progression to infection-related long-term Sequelae such as chronic hepatitis, liver cirrhosis, hepatocellular carcinoma, and even death.[5]In addition, the global prevalence of HBV infectionvaries in terms of geographic region, and it is highly endemicin resource-limitedcountries, particularly those in East Asia, Sub-SaharanAfrica, and Western Pacific regions.[6]

Globally, approximately 65 million women of reproductive age groups are infected with hepatitis B virus and 9 in every 10 mothers with hepatitis B infection transmit the diseases to their new born at the time of birth. Children born to hepatitis B surface antigen-positive and hepatitis B envelope antigen-positive women have a 70–90% more chance of prenatal acquisition of hepatitis B virus and about 85–90% will become the chronic carrier of the diseases. The World health organization (WHO) recommends screening pregnant mothers for hepatitis B virus infection, providing its vaccine and hepatitis B immune globulin to neonates within the first day of childbirth.

Reported prevalence of HBsAg among pregnant women vary from one region to another. The prevalence of chronic HBV infection was estimated to be 3.5% among women of reproductive age globally[7]. In African countries the prevalence ranges within 6–25%[7]. A national survey of hepatitis B in Nigeria showed prevalence of 12.2% among the general population[8], a systematic review of hepatitis B infection among pregnant women in Nigeria found a prevalence of 14.1%[9]. HBsAg prevalence documented among pregnant women in Bayara, Bauchi State was 17.2%[10].

In 2016, the WorldHealth Organization committed to eliminating hepatitis B, a majorpublic health threat, by 2030.[4]HBV is transmitted between individuals via percutaneous ormucosal contact with contaminated blood and other body fluids. In highly endemic areas, the predominant route of HBV transmission ismother-to-childtransmission (MTCT), accounting for approximately 90% of the global prevalence. Further, approximately 4.5 millionwomen with chronic HBV infection give birth annually.[5]Generally,infants infected with HBV have an 80%–90%risk of progression toa chronic disease state, which further develops to liver cirrhosis and hepatocellular carcinoma in young adulthood.[6–8]By contrast,pregnant women with HBV are more likely to present with maternal and neonatal complications including preeclampsia, placenta previa,preterm delivery, placental separation, and gestational diabetesmellitus.[9–11] It has been also reported that Hepatocellular carcinoma (HCC) is more likely in individuals who contracted the HBV infection perinatally than those through horizontal transmission; therefore, interrupting this mother-to-child transmission will significantly reduce the burden of liver disease.[12]The infection in pregnancy poses a serious risk to the neonate.[13]

Despite the availability of effective childhood vaccines, the prevalence of HBV infection in sub-Saharan Africa remains unacceptably high. Without appropriate prophylaxis and post-exposure immune prophylaxis, infants born to HBV infected mothers stand the risk of acquiring the virus which will eventually become chronic, and subsequently lead to death occasioned by the high transmission rate.[14]Despite the existence of vaccines, HBV infection remains a major obstacle to public health in low resource countries especially inSub-Sahara Africa and as well as China.[15]More than 86 million peopleare living with chronic HBV infection, and those with infection accountfor one-thirdof the infected population worldwide.[15]Theoverall efficacy rate of combined hepatitis B vaccine and hepatitisB immunoglobulin when used as a preventive strategy range from 90% to 95%.

The World Health Organization (WHO) recommends that all infants receive three doses of vaccine that will provide a protection level of 95% or more against HBV infection. The first dose is given within 24 hours after delivery, and a follow-up of additional two doses.[16] The use of vaccines at birth remains the hallmark of HBV prevention. In resource-limited countries including Nigeria, healthcare facilities are not easily accessible and potent vaccines are most times unavailable, and this accounts for the death of over 10 million children every year.[17] About 13.0% of infants born to infected mothers with high HBV viral load are positive.[18]

However, MTCT still occurs after passive-activeimmunization, and it has become the major route of HBV infectionamong Nigerian and other low resource nations and even among Chinese.[19]HBV infection among women of reproductive ageand pregnant women is endemic with regional variations.[20]Therefore, antenatal screening for HBV serologic markers during pregnancy is significantly important in preventingHBV MTCT.

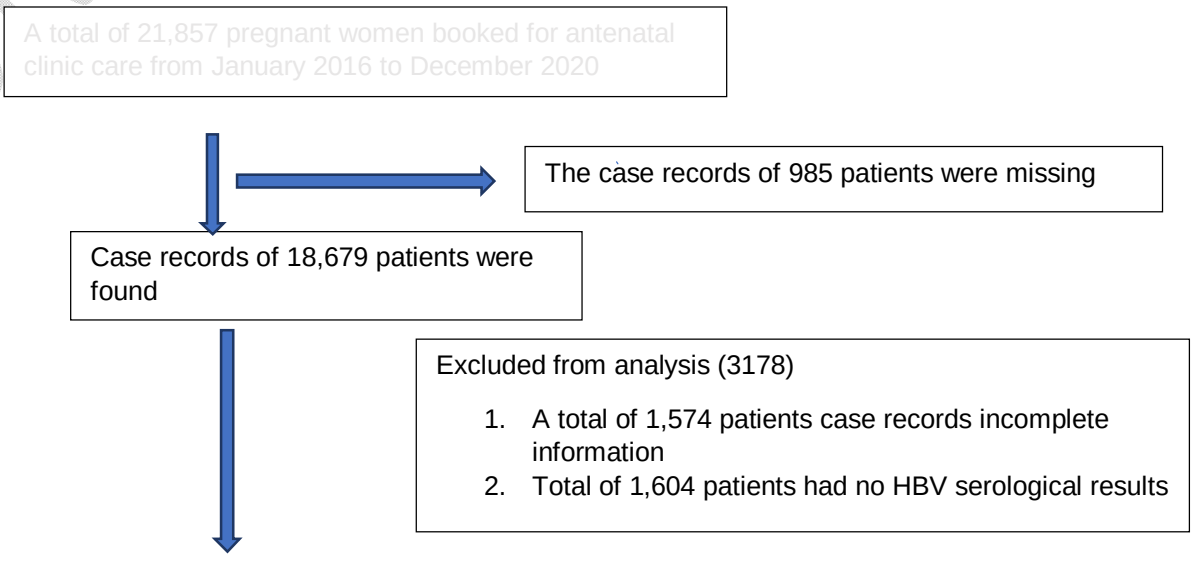
The economic and time costs have traditionally been a barrierthat restricts follow-uptreatment of MTCT in Benue State, its rural populace and Nigeria at large. Therefore, several high-riskinfants bornto mothers positive to hepatitis B surface antigen (HBsAg) do notreceive timely human hepatitis B immune globulin and the first vaccinedose. The prevalence of HBV infection remains high due to insufficientcoverage rates of vaccination and limitations in terms of other preventive measures.[21]Hence, studies about HBV infectionamong pregnant women may increase knowledge about the infection, thereby possibly contributing to transmission reduction.

The current retrospective study aimed to explore the prevalenceof HBV infection among pregnant women attending antenatal care in Federal Medical Centre, Makurdi, Benue State, Nigeria.The results could provide updated data about the effective implementationof better vaccination programs and preventive strategiesagainst HBV in southern China.

Materials and Methods

A retrospective, single-center study aimed to evaluate the prevalence of HBsAg among pregnant women attending antenatal clinics at the Department of Obstetrics and Gynaecology of Federal Medical Centre (FMC), Makurdifrom January 1st, 2016 to December 31st, 2020. All pregnant women who visited this hospital underwent routine screening for HBV infection by performing blood tests during their initial antenatal visit. Data were retrospectively collected from the hospital's database of the Record Department of the Hospital. Pregnant women without data about demographic characteristics and laboratory examination results and those with incomplete information about five HBV serology markers (results based on HBV Profile as defined in Table 1) were excluded from the study. The current research was approved by the Ethics Review Committee of the FMC, Makurdi. Since it was a retrospective study, no written informed consent was obtained from the patients before the study initiation.

Figure.1 Study flow diagram.



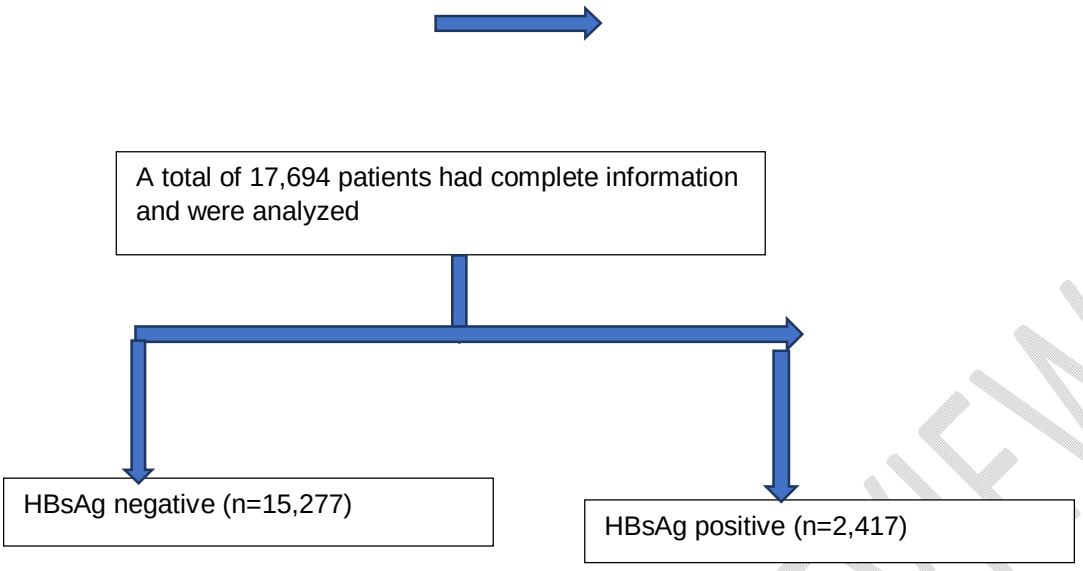


Table 1. Different statuses of HBV infection based on serological markers(HBV Profile)

HBsAg	HBsAb	HBeAg	HBeAb	HBcAb	Interpretation
–	–	–	–	–	Susceptible to infection
–	+	–	–	–	HBV immunity
–	+/–	–	+/–	+	Previous/occult infection
+	–	–	+/–	+	Inactive HBsAg carrier
+	–	+	–	+/–	Active infection

Abbreviations: HBsAg- hepatitis B surface antigen; HBsAb- hepatitis B surface antibody; HBeAg- hepatitis B evelope antigen; HBeAb- hepatitis B evelope antibody; HBcAb, hepatitis B core antibody.

Results

Between January 1st, 2016 and December 31st, 2020, all pregnant women admitted to the antenatal unit of the Department of Obstetrics and Gynaecology of Federal Medical Centre (FMC), Makurdi were screened for hepatitis B virus infection.A total of 21,857 pregnant women booked for antenatal clinic care in the centre during the years under review. Out of the above number of patients, 17,694 (80.95%) case records were retrieved with complete information. A total of 4163 were excluded from the study either because of missing case records or incomplete information about the patients. Figure 1 shows the study flow diagram. Therefore, 17,694 pregnant women were finally included in the study and this served as the basis for analysis. Table 2 showed sociodemographic characteristics of pregnant women during the study period with the average age of the studied population as 29.3 ± 4.1 years. Table 3 depicts the clinical characteristics of the pregnant women with 46.39% of them had no obvious health challenges in pregnancy while 32.16% had various degree of anaemia in pregnancy. The pregnant women were

divided into the HBsAg-positive and HBsAg-negative groups based on the sociodemographic and clinical characteristics of these participants as showed in Table 4. Of 849 pregnant women that had IJECC_120552 in pregnancy, 50.53% (429) were positive to HBsAg serological testing (Table 4) with 11.43% of them having active infection as showed in Table 5.In total, 2417 pregnant women were HBsAg-positive, with a prevalence rate of 13.66%.

Subsequently, the clinical characteristics of pregnant women were analyzed by HBV profile screening test. As shown in Table 5, the HBV profile of pregnant women in the five different groups were as follows: susceptible to infection (43.44%, n = 7686), HBV immunity (36.15%, n = 6397), previous/occult infection (14.91%, n = 2638), inactive HBsAg carrier (4.08%, n = 722), and active infection (0.42%, n = 251).

Table 2: Sociodemographic Characteristics of the Pregnant Women (17,694)

	2016	2017	2018	2019	2020	2021
Age group						
15-19	151	79	96	197	219	135
20-24	417	341	397	433	502	399
30-34	838	813	905	975	637	1053
35-39	189	107	179	218	303	246
≥40	57	39	21	61	84	49
Marital status	672	411	436	697	585	613
Single						
Married	2118	1741	2020	2135	2413	2302
Widow	301	217	225	341	261	206
Religion	2474	2081	2281	2471	2354	2406
Christianity						
Islam	486	214	263	475	716	619
Traditionalist	131	74	137	227	189	96
Educational status						
No formal	145	84	107	231	196	205
Primary	573	259	413	488	517	612
Secondary	754	577	819	637	503	1061
Tertiary	1619	1449	1342	1817	2239	1243
Occupation						
Civil Servant	1318	978	1147	1166	1142	1515
Farming	639	397	488	685	819	857
Trading	1047	931	941	1106	953	573
Student	87	63	105	217	345	176
Parity						
0	739	563	716	575	849	613
1-4	1967	1588	1600	2349	2019	2216
≥5	385	218	365	249	391	292

Table3: Clinical Characteristics of Pregnant Women (17,694)

Health status	**Total number of patients**	**Percentage (%)**
Anaemia in Pregnancy	5,691	32.16

Hypertensive Disorder in Pregnancy	1257	7.10
Diabetes Mellitus in Pregnancy	1089	6.15
HIV in Pregnancy	849	4.80
Cardiac Disease in Pregnancy	285	1.61
SCD in Pregnancy	106	0.60
Renal disease in Pregnancy	97	0.55
Syphilis Infection in Pregnancy	113	0.64
No obvious health challenge in Pregnancy	8207	46.39
Total	17694	100.00

Table 4: Socio-demographic and Clinical Characteristic of Pregnant Women with HBV Infection (17,694)

Status	**Total Number of Patients**	**HBV Status**		**Percentage (%)**
		Negative	Positive	
Age group				
15-19	877	770	107	0.60
20-24	2489	2171	318	1.80
25-29	7554	6475	1079	6.10
30-34	5221	4660	561	3.17
35-39	1242	959	283	1.60
≥40	311	242	69	0.39
Marital status				
Single	3414	2783	631	3.67
Married	12729	11116	1613	9.12
Widow	1551	1378	173	0.98
Anaemia in pregnancy	5691	5142	549	9.65
Hypertensive disorder in pregnancy	1257	1020	237	18.85
Diabetes mellitus in pregnancy	1089	970	119	10.93
HIV in pregnancy	849	420	429	50.53
Cardiac disease in pregnancy	285	269	16	5.61
SCD in pregnancy	106	104	2	1.89
Renal disease in pregnancy	97	92	5	5.15
Syphilis infection in pregnancy	113	104	9	7.96
No obvious health challenge during pregnancy	8207	7156	1051	12.80
Total	**17694**	**15277**	**2417(13.66%)**	

Table 5: HBV Profile of Pregnant Women who had HBV Infection (2,417)

	Susceptible to Infection	**HBV Immunity**	**Previous Infection**	**Carrier/Inactive Infection**	**Active Infection**	**Percentage of Active Infection**

Pregnant Women with no obvious Health Challenge	3,331	2,273	1207	287	109	1.33%
Anaemia in Pregnancy	2,214	2,197	1,095	169	16	0.28%
Hypertensive Disorder of Pregnancy	719	339	131	45	23	1.83%
DM in Pregnancy	644	230	124	109	4	0.37%
HIV in Pregnancy	407	192	44	109	97	11.43%
Cardiac DX in Pregnancy	127	104	29	24	1	0.35%
SCD in Pregnancy	85	17	2	-	-	0.00%
Renal DX in Pregnancy	76	19	4	-	-	0.00%
Syphilis in fetus in pregnancy	83	26	2	1	1	0.88
Total	7686 (43.44%)	6397 (36.15%)	2638(14.91%)	722 (4.08%)	251 (0.42%)	

Discussion

The HBV infection affecting pregnant women may result in maternal morbidity and mortality. It could also result in chronic infection in the newborn. Prevalence of hepatitis B infection varies in different parts of the world. Even within the same country there are regional and population specific variations. Immunosuppression in pregnancy is of clinical and epidemiological relevance with regards to hepatitis B viral infection[1-5]. Despite the provision of vaccines, HBV infection remains a major concern worldwide, particularly in developing countries[1,4,6-7]. The significant progress in antiretroviral treatment caused a remarkable decline in morbidity and mortality associated with HBV infection. However, HBV can be easily transmitted from mother to child during delivery. The major route of transmission of chronic hepatitis B infection to infants is vertical transmission (mother-to-child transmission: MTCT) as well as horizontal early childhood transmission[6]. Therefore, the prevention of these infections from the vertical or horizontal transmission is the most important strategy to control the HBV epidemic. Vertical transmission of HBV is more common in children born to women who have high HBV viral load in their blood at birth[5-6,11]. Antiretroviral therapy for pregnant women reduces the incidence of MTCT and maternal and child mortality[14]. Pregnant women should be screened promptly during their antenatal care visits, and proper treatment must be provided to decrease the rate of MTCT. Therefore, the current retrospective, single-center study was aimed to evaluate the prevalence of HBV infection among pregnant womenwho accessed antenatal services at the Department of Obstetrics and Gynaecology of Federal Medical Centre, Makurdi. Results showed that the overall prevalence of HBsAg positivity was extremely high at 13.66% among pregnant women in the study area which is in agreement with prevalence of 6–25% reported by the WHO African region[8,17].This finding is similar to that reported by Colin et al[5,6] that classified Nigeria in the high endemicity group but lower than prevalence of 6.7% reported by Mustapha et al among women attending antenatal care services in Primary Health Centres in Gamawa Local Government Area[5]. The finding from our study supports the fact that the prevalence of HBV infection varies widely based on location and subpopulations. The implication of this finding is that pregnant women, even in rural communities, are at high risk of HBV infection, hence the need for HBV screening during antenatal care services.

The prevalence in our study is lower than a similar study conducted in Bayara hospital, Bauchi State where a prevalence of 17.2% was documented[11]. In the North-Central geopolitical zone, a prevalence of 12.3% was reported from Minna Niger State by Ndams et al [11-16] and 11.0% was reported in Makurdi, Benue State by Mbaawuaga et al.[15] which are closely similar to our finding. In the south-western part of the country, a prevalence of 16.5% was reported in Osogbo, Osun State by Kolawole et al [16] and 8.3% in Ibadan by Chinenye et al.[12] Southern states reported a prevalence of 12.5% in Edo State by Ugbebor et al.[14,15] It is also noted to be similar to the 9.6–18.6% observed by Musa et al[13] in a country wide systematic review. The differences in the reported seroprevalence rates of HBV among pregnant women may be due to variation in the geographical location, socio-cultural practices, study design, level of care for the study facility, sample size and test methods employed. Most of the studies quoted above were carried out at secondary and tertiary level of care located mostly in urban or semi urban populations while few studies were carried out at primary health care setting in rural communities.

Moreover, the prevalence of HBV infection was high between the ages of 25 and 34 years which was more with married couples. In addition, it was observed that, pregnant mothers who had anaemia in pregnancy and Hypertensive disorders of pregnancy were at high risk (9.65%) and (18.85%) of HBV infection respectively during the study period. For patients with HIV infection, 50.53% of them have co-infection with HBV infection with active HBV infection at 11.43%. Thecurrent study provided critical data that can be used for assessing the impact of current prevention strategies and for planning vaccination and other preventive measures in the study area as well as Nigerian at large.

Currently, the global prevalence of HBV infection is highly heterogeneous[21]. The classification of high endemic is defined as a prevalence rate of ≥8%. Previous studies have reported that the proportion of HBV carriers is relatively low at 0.1%–2.0% in the United States and Western Europe.The finding of proportion of HBV carriers of 4.08% among the studied population during the study period is however, far lower than the high carrier rate (up to 8%–20%) in Africa and most countries in Asia[18]. This finding is however, higher than that reported in theUnited States and Western Europe.The HBV infection remains a significant public health issue inNigeria, with prevalence rate varying significantly in different geographic areas, even if it is heterogeneous within a region among different studies. The current study showed that the prevalence rate of HBsAg positivity in the study area was 13.66%, which was higher than that reported in Hakka, China (11.74%)[19].

Thedifference in prevalence rate observed in our study with other reported studies could be attributed to socioeconomic status, public health education, level of awareness, and infection prevention practices by the community and other nations. HBV vaccines have been available since the early 1980s. Nigeria is among the developing countries that integrated the hepatitis B vaccine for newborns into routine immunization in 1998[4,6] and since then it has been part of National Programme on Immunization (NPI) which remained free but high level of illiteracy, low socioeconomic status of many families in Nigeria as well as poor social/health structures have largely hindered wide scale utilization of this programme. The HBV vaccination in Nigeria is entirely free unlike other nations like China where parents had to pay out of pocket[19]. Therefore, infant vaccination coverage isuneven in Nigeria due tohigh level of illiteracy, low socioeconomic status of many families, religious and cultural barriers as well as poor social/health structures.

From a policy perspective point of view, the prevalence of HBV infection should be updated to support targeted immunization and health education and enhanced interventions for MTCT prevention. HBsAg positivity represents active acute or chronic infections. Meanwhile, HBeAg indicates active replication and a high HBV infectivity[6,19]. The HBeAg positivity among childbearing-age women is a major determinant of perinatal HBV transmission. Previous studies have revealed that without any intervention, the frequency of HBV perinatal transmission can reach up to 90% in infants born to women who are HBsAg and HBeAg carriers[19,20].In HBV endemic areas, HBV infections commonly occur perinatally, and they are observed in unvaccinated or inadequately vaccinated subgroups of children.

Regularantenatal screening of pregnant women for HBV infection became routine for all antenatal in 2016 in the studied centrebut before then it was not common and compulsory in the centre. The high infection rate might be attributed to poverty, lack of health education and knowledge about infection status, and poor awareness of HBV infection prevention among our study groups. In individuals who are immunocompetent, hepatitis B vaccines can have protective effects lasting for at least two decades[5,6,19,20]Nonetheless, anti-HBs vaccination titers can wane with time and may decrease below protective levels. The prevalence of HBsAg in pregnant women increased with age, with the highest positivity rate in participants aged >30 years, followed by those aged 25–29years. Meanwhile, pregnant women aged <20 years had the lowest rates of HBV infection in our study. In accordance with our findings, other studies showed that the seroprevalence of HBV infection increased with age in both pregnant women and the general population.[3-6,19-21] The effectof age may be correlated with the progressive loss of protective antibody levels against HBsAg over time. However, the seropositive rate of HBsAg or the prevalence of HBeAg decreased over time.

Nevertheless, the high prevalence rate of HBV in our study population remains a significant concern. This emphasizes the need for continuous routine antenatal HBsAg assessment among pregnant women and the implementation of appropriate measures during childbirth to reduce transmission.

Conclusion

Theprevalence rate of HBV infection among pregnant women remained high during the study period. Hence, cautious surveillance of maternal HBV infection status should be recommended, and immunization programs must be strengthened.

The current study had limitations that should be acknowledged

Itwas a single-center, hospital-based, retrospective study. Therefore, selection bias might have existed as well as missing records and its capability of inferences was limited. Second, data about vaccination information and risk factors associated with MTCT of HBV infection were not collected. Third, follow-up analysis of maternal and neonatal outcomes was not performed.

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