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# Epidemiology of Hepatitis-B Infection among Pregnant Women in Yola North Local Government Area Adamawa State, Nigeria

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**ABSTRACT:** Hepatitis b virus infection presents major threat to public health throughout endemic countries of tropical and sub-Saharan Africa. There is a scarcity of data on HBV in Adamawa State, Nigeria. Hence, the objectives of this paper is to evaluate the epidemiology of hepatitis B infection among pregnant women in Yola North Local Government Area, Adamawa State Nigeria using Structured questionnaire to collect information from 1,254 pregnant women who come for antenatal clinic (ANC) for the first visit. Five (5) mL of blood samples were drown from each consented pregnant women for serological analysis by using rapid diagnostic test/ELISA. A pooled prevalence of 4.1% was recorded for HBV. Of all the sociodemographic characteristics studied, only occupation recorded a significant association with HBV (P=0.023) with highest prevalence among house wives (2.2%) and lowest among civil servants (0.6%). Also, considering the eight attitudes-related questions used to assess the participants, a good attitude of 73.9% toward HBV was reported. Three factors that recorded significant association with hepatitis b infection were; ever screened for HBV (AOR=0.349; 95% CI= 0.121-1.007; P=0.052), can be infected with HBV (AOR=0.107; 95% C.I =0.017-0.660; P=0.016) and people with HBV are discriminated in the society (AOR=3.071; 95% CI= 1.508-6.253; P=0.002). Therefore, awareness on modes of transmission, early detection and screening of HBV for all pregnant women attending ANC must be strengthened to minimize and control vertical transmission of the infections.

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Hepatitis B virus (HBV) infection is estimated to account for 300 million chronic infections and 1 million deaths each year (World Health Organization, 2021). The global burden of HBV infection is unevenly distributed, with particularly high prevalence in some populations in Africa and South East Asia (Cooke *et al*., 2019). Likewise, HBV is not experienced equally across society, with a disproportionate prevalence and impact on marginalized and deprived populations, whose needs are poorly met by existing healthcare research, services, interventions and policies (O'Hara *et al*., 2017). Viral hepatitis is recognized as a global health priority within the United Nations Sustainable Development Goals 2030 (SDG30). These underpin ambitious targets including 90% HBV vaccine coverage, reducing new chronic infections and new infections by 90% and attributable mortality by 65% (Cooke *et al*., 2019). Vaccination against HBV, including universal birth dose administration, is a key elimination strategy and is estimated to have prevented 310 million cases of HBV infection between 1990 and 2020 (Cooke *et al*., 2019, de Villiers *et al*., 2021). However, birth dose vaccine implementation has been slow in reaching the most vulnerable populations, while a three-dose vaccine schedule remains a challenge (de Villiers *et al*., 2021). Lack of education and awareness, inadequate living conditions, lack of access to healthcare services, and poverty and stigma among marginalized populations create a permissive environment for HBV transmission. Chronic HBV infection usually remains asymptomatic until late complications (liver fibrosis, cirrhosis, and hepatocellular carcinoma (HCC)). Silent infection, in

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combination with barriers to testing in the most affected populations, explains why only an estimated 10% of those living with HBV infection are diagnosed (O'Hara *et al*., 2017). There is no cure for HBV, but antivirals (nucleostide analogue agents) can suppress viral replication. Based on international treatment guidelines, only a minority of those with chronic infection are eligible for treatment, and a small proportion of these can actually access consistent therapy (McNaughton *et al*., 2021). Risk stratification requires consistent surveillance (including clinical review, imaging and laboratory tests), but this can feel burdensome and irrelevant for some people living with asymptomatic infection and/or those who do not meet treatment criteria (Mofokeng, 2021, Adjei *et al*., 2019). Hepatitis B is also preventable viral infection (WHO, 2013). It is caused by hepatitis B virus (HBV), a double-stranded DNA virus belonging to the Hepadenaviridae family, and its infection can lead to a wide range of clinical spectra from acute to chronic hepatitis, cirrhosis, and hepatocellular carcinoma. Hepatitis B viral infection is endemic in region of the world including sub-Saharan Africa (WHO, 2013; Gambo, 2012). The importance of the disease is stressed by the ample reservoir of carriers seen in human population globally which are estimated to be 320-350 million. HBV is acquired by contaminated blood product exposure, sexual activity, perinatal transmission is also important source of infection (Connell *et al*., 2011). The virus spreads through blood, semen and other bodily fluids (Vital, 2019). In regions where HBV is highly endemic (Ott *et al*., 2012), transmission of the virus often occurs vertically from mother to child as well as horizontally through close contacts during infancy (Vital & Ghani, 2019). Women during childbearing age have a 1 to 2% incidence of chronic hepatitis C virus infection (CHBV), with higher rates in those with risk factors like patients undergone hemodialysis (Rustgi *et al*., 2007). Pregnancy in patients with chronic hepatitis B virus infection (CHBV) is associated with mother-to-child transmission (MTCT) and may be associated with increased maternal and fetal complications (Ott *et al*., 2012). Maternal infection with either HBV have been linked to adverse pregnancy and birth outcomes, including MTCT. MTCT for HBV has been reduced to approximately 5% overall in countries including the US that have instituted postpartum neonatal HBV vaccination and immunoprophylaxis with hepatitis B immune globulin (Reddick *et al*., 2011). Antigen positive mother will develop HBV infection. World Health Organization estimates chronic hepatitis infection more than 240million people worldwide (Borgia *et al*., 2012). In highly endemic countries, MTCT accounts for most cases of infections and is, therefore, the main mechanism that maintain infection in the population (EASL, 2012). Hepatitis B virus is infectious diseases that is of global public health concern. Complication of the two diseases is more pronounced among immune-compromised Although HBV infections in pregnant women is likely to be systematically screened for and managed according to national guideline in Nigeria, there is inconsistent routine screening in most of the primary health care clinics in Yola north, Adamawa State. Furthermore, it has been observed that little or no special attention is given to babies born to hepatitis b positive mothers in the study area which predispose them to chronic liver diseases. This situation has motivated the research to be carried out on "the epidemiological study of hepatitis B infection among pregnant women attending ANC in primary healthcare clinics in Yola north L.G.A. Adamawa State". Therefore, the objectives of this paper is to evaluate the epidemiology of hepatitis B. infection among pregnant women in Yola north Local Government Area in Adamawa State, Nigeria.

## MATERIALS AND METHODS

*Study Area:* The study was conducted in Yola-North Local Government Area which has a population of 336,648 (NPC 2006) and it is located in central zone of Adamawa State which lies between latitudes 9º, 11'N to 9ºN and longitudes 12º 20'N to 12º 39'N covering a tropical climate marked by dry and rainy season. Maximum temperature in Yola-north can reach 40ºC around April and minimum temperature could be as low as18.3ºC between December and early January. Relative humidity in the areas is about 26% in the month of January while February is the lowest, with high relative humidity valves of 58, 69, 79, 79, 77, and 66 respectively could be recorded during the month of May to October, particularly during the month of July and August as the peak with about 80% relative humidity (Adebayo, 1999). Yola-north is both an administrative center and agrarian community. The major occupations of resident are civil servant, farmers and traders. The common agricultural products cultivated in this area include; vegetables, rice, maize and most farmers use refuses as fertilizers on their vegetable farms. Their major sources of drinking water are table, sachet and borehole water. Yola north is an endemic area for malaria with transmission all year round and peak during the rainy season.

*Determination of Sample Size:* The sample size for this study was determined using the formula suggested by (Lwanga, 1991) adapted by Enock *et al*. (2021). It stated that for a population greater than 10,000, the following formula is applicable

$$n = \frac{z^2 pq}{d^2}$$

Where; n = The desired sample size (when population is greater than 10,000); z = The normal standard deviation, usually set at 1.96 which corresponds to 95 percent confidence level; P = Proportion in the target population estimated to have a particular characteristic. If there is no reasonable estimate, then use 50% (0.5). However, in this study, HBV and malaria prevalence of 8.7% (Yim *et al*. 2021) and 8%

(Tesfu *et al*. 2022) respectively among pregnant women were used to determine the sample size.

q = 1.0-p
d = Degree of accuracy desired usually set at 0.05

Using the above formula,

$$n = \frac{z^2pq}{d^2} = \frac{(1.96)^2 \times 0.08(1-0.08)}{(0.05)^2} = 113$$

Therefore, a total of 1,254 pregnant women were sampled; 114 from each of the 11 PHCCs located in all the ward headquarters in Yola north local government, Adamawa State.

*Ethical Clearance:* Approval was sought and obtained from the State Ministry of Health Yola and the managements of each sampling primary health care centers. Consent letter was administered to each of the participating subjects after clearly informing them about the objectives as well as the aim of the research. They were also informed of their right to participate or withdraw from the research before, during and even after the research with no consequence. They were also educated on the confidentiality of the outcome of the research.

*Hepatitis B Virus Test:* The hepatitis B virus infection test was conducted according to the manufacturer's instructions (Premier Co. Ltd., India, and Transnational Technologies Inc., UK) using the HBV surface antigen RDT kits, which are sensitive to and specific for the identification of the hepatitis surface antigens as specified by the manufacturers. The manufacturer's protocol will be strictly adhered to during testing, results reading, and interpretations. The presence of one purple colour band at the "C" column after the incubation will suggests a negative result. The presence of two purple colour bands at the "C" and "T" columns will indicate a positive result. However, when no purple colour band was observed at both "C" and "T" columns, or at the "T" column, the tests will be considered invalid and will be repeated with new test kits.

*Data Analysis:* All data collected were analyzed using Statistical Package for Social Sciences version 23.0. Simple percentage (%) was used to determine the prevalence of malaria, hepatitis b and coinfections and hepatitis B biomarkers. Chi-square was used to determine the association of malaria knowledge and preventive measures use in regards to malaria infection, socio-demographic characteristics in regards to malaria and hepatitis B infection and Level of ownership and utilization of ITNs according to PHCCs. Also, binary logistic regression statistic. was employed to predict the effects of attitudes and risk factors of HBV in pregnant women towards HBV infection. All statistical values were considered significant at $p<0.05$.

## RESULTS AND DISCUSSION

*Socio-Demographic Characteristics of Pregnant Women in Regards to Hepatitis B Infection:* Regarding age in terms hepatitis b prevalence, age group 24-30 years recorded highest prevalence of 2.0% and least (0.3%) in age group 31-37years. Age group 15-23 years had hepatitis b prevalence of 1.8% and age group ≥38 years recorded no hepatitis b seropositive prevalence and there was no significant association between hepatitis b infection and age (p=0.223). In light of stage of pregnancy, highest hepatitis b prevalence of 1.9% was recorded among pregnant women in their second trimester and least (1.1%) was recorded for first and third trimester each with no significant association (p=0.194). Also, regarding parity, highest hepatitis b prevalence of 1.8% was recorded in primigravidae, 1.4% in multigravidae and 1.0% (least) in secungravidae without significant association (p=0.615). In terms of occupation, hepatitis b prevalence in the order 0.6%, 0.1%, 1.3% and 2.3% for civil servants, unemployed, business and house wives were recorded respectively. Highest prevalence (2.3%) was recorded among house wives and least (0.1%) among unemployed with significant association (p=0.023). Educational level had no association with hepatitis b prevalence (p=0.651). Highest prevalence of 2.0% was recorded among those with education attainment up to secondary level and least (0.4%) among primary educational level. Other prevalence includes 1.0% for no formal education and 0.8% for tertiary educational level

*Logistic Regression of Attitudes in Regards to HBV Infection among Pregnant Women:* Table 2 displays the influence of attitudes on hepatitis b infection among pregnant women. A total of eight domains that constitute attitude-related factors toward hepatitis b infection were studied. Out of the domains, three factors recorded significant association with hepatitis b infection ($p<0.05$). These factors were; ever screened for HBV (AOR=0.349; 95%CI= 0.121-1.007; P=0.052), can get HBV (AOR=0.107; 95% C.I =0.017-0.660; P=0.016) and people with HBV are discriminated in the society (AOR=3.071; 95%CI= 1.508-6.253; P=0.002). As presented in table 4.5, women who are vaccinated are 95% less likely to became infected with HBV than those pregnant women that are not vaccinated (AOR=0.748; 95%CI= 0.286-3.142; P=0.931). Also, pregnant women who said that they are ever screened and can be infected with HBV are less likely to become infected than their counterparts. However, pregnant women who fear discrimination in the society as a result of HBV are 3.07 times high chance to be infected with HBV than their counterparts (AOR=3.071; 95%CI= 1.508-6.253; P=0.002), those who avoid meeting HBV patients are

1.08 times likely to become infected with HBV than those who avoid meeting HBV patients (AOR=1.08; 95%CI= 0.470-2.482; P=0.856) while those who fear cost of treatment of HBV are 1.25 times likely to become infected with HBV than their counterpart (AOR=1.254; 95%CI= 0.565-2.786; P=0.578).

**Table 1** Socio-Demographic Characteristics of Pregnant Women in Regards to Hepatitis B Infection

| **Variables** | **Number Examined (%)** | **HBV Infection** | | **p-value** |
|---|---|---|---|---|
| | | **Pos. (%)** | **Neg. (%)** | |
| Age | | | | |
| 15-23 | 516(41.1) | 23(1.8) | 493(39.3) | .223 |
| 24-30 | 510(40.7) | 25(2.0) | 485(38.7) | |
| 31-37 | 200(15.9) | 4(0.3) | 196(15.6) | |
| ≥ 38 | 28(2.2) | 0(0.0) | 28(2.2) | |
| **Total** Stage of pregnancy | **1254(100)** | **52(4.1)** | **1202(95.9)** | |
| First trimester | 230(18.3) | 14(1.1) | 216(17.2) | .194 |
| Second trimester | 580(46.3) | 24(1.9) | 556(44.3) | |
| Third trimester | 444(35.4) | 14(1.1) | 430(34.3) | |
| **Total** Parity status | **1254(100)** | **52(4.1)** | **1202(95.9)** | |
| Primagravidae | 450(35.9) | 22(1.8) | 428(34.1) | .615 |
| Secungravidae | 320(25.5) | 12(1.0)) | 308(24.6) | |
| Multigravidae | 484(38.6) | 18(1.4) | 466((37.2) | |
| **Total** Occupation | **1254(100)** | **52(4.1)** | **1202(95.9)** | |
| Civil servant | 60(4.8) | 7(0.6) | 53(4.2) | **.023** |
| Farmer | 50(4.0) | 0(0.0) | 50(4.2) | |
| Unemployed | 30(2.4) | 1(0.1) | 29(2.3) | |
| Business | 350(27.9) | 16(1.3) | 334(26.6) | |
| Housewife | 764(60.9) | 28(2.2) | 736(58.7) | |
| **Total** Educational level | **1254(100)** | **52(4.1)** | **1202(95.9)** | |
| Non-formal education | 220(17.5) | 12(1.0) | 208(16.6) | .651 |
| Primary | 140(11.2) | 5(0.4) | 135(10.8) | |
| Secondary | 590(47.0) | 25(2.0) | 565(45.1) | |
| Tertiary | 304(24.2) | 10(0.8) | 294(23.4) | |
| **Total** | **1254(100)** | **52(4.1)** | **1202(95.9)** | |

*Pearson Chi-square ($\chi^2$), P<0.05 is considered significant, Pos.= positive, Neg.= negative, % = percentage.*

**Table 2.** Logistic Regression of Attitudes in Regards to HBV Infection among Pregnant Women in Yola North L. G. A. Adamawa State, Nigeria

| Variables | Categories (%) | HBV status | | AOR (95% C.I) | P-value |
|---|---|---|---|---|---|
| | | Pos. (%) | Neg. (%) | | |
| Ever screened for HBV | Yes (86.8) | 42(3.4) | 1047(83.5) | 0.349(0.121-1.007) | **0.052** |
| | No (13.2) | 10(0.8) | 155(12.4) | | |
| When diagnosed of HBV I will go further for investigation and treatment | Yes (82.8) | 41(3.3) | 997(79.6) | 1.351(0.325-5.608) | 0.679 |
| | No (17.2) | 11(0.9) | 205(16.3) | | |
| Vaccinated against HBV | Yes (82.2) | 44(3.4) | 987(78.7) | 0.948(0.286-3.142) | 0.931 |
| | No (17.8) | 8(0.6) | 215(17.1) | | |
| Avoid meeting HBV patients | Yes (85.9) | 45(3.6) | 1032(82.3) | 1.080(0.470-2.482) | 0.856 |
| | No (14.1) | 7(0.6) | 170(13.6) | | |
| Can get HBV | Yes (86.7) | 40(3.2) | 1047(83.5) | 0.107(0.017-0.660) | **0.016** |
| | No (13.3) | 12(1.0) | 155(12.4) | | |
| People with HBV are discriminated in the society | Yes (82.2) | 41(3.3) | 990(78.9) | 3.071(1.508-6.253) | **0.002** |
| | No (17.8) | 11(0.9) | 212(16.9) | | |
| People with HBV fear cost of treatment | Yes (13.2) | 8(0.6) | 157(12.6) | 1.254(0.565-2.786) | 0.578 |
| | No (86.8) | 44(3.5) | 1045(83.3) | | |
| People with HBV fear transmitting the disease to family members | Yes (30.8) | 19(1.5) | 367(29.3) | 1.297(0.643-2.618) | 0.467 |
| | No (69.2) | 33(2.6) | 835(66.6) | | |
| Constant | | | | 24.472 | 0.000 |

*Abbreviation: pos.: positive, Neg.: negative, %: percentage, HBV: Hepatitis B virus, AOR: Adjusted odd ratio, C.I: confidence interval, P-value <0.05 is considered significant.*

*Binary Regression of Risk Factors Associated with HBV among Pregnant Women:* Binary regression in table 3 reveals the effects of risk factors associated with HBV among the participants. Pregnant women who had family history of HBV are 3.74 times likely to become infected with HBV than their contemporary who did not have family history of HBV (AOR=3.741; 95%CI= 1.143-2.248; P=0.029). Also, pregnant women who take alcohol (8.3%), share of sharp object (11.4%) and had history of blood transfusion have increase chances of becoming infected with HBV than their counterparts (AOR>1). On the contrary, pregnant women who had history of surgery (10.4%), multiple sex partners (33.2%) and infant born to mothers infected with HBV (15.6%) are less likely to become infected with HBV than their counterparts (AOR<1).

**Table 3.** Binary Regression of Risk Factors Associated with HBV among Pregnant Women in Yola north L. G. A. Adamawa State, Nigeria

| Variables | Responses | | Coef. (B) | AOR (95% CI.) | p-value |
|---|---|---|---|---|---|
| | Yes (%) | No (%) | | | |
| History of blood transfusion | 156(12.8) | 1098(87.2) | .797 | 2.219 (0.280-17.574) | .450 |
| Alcoholism | 104(8.3) | 1150(91.7) | .612 | 1.845 (0.737-4.617) | .191 |
| Multiple sex partners | 416(33.2) | 838(66.8) | -.045 | 0.956 (0.507-1.802) | .888 |
| Sharing of sharp object | 143(11.4) | 1111(88.6) | .540 | 1.715 (0.209-14.104) | .616 |
| Surgery | 130(10.4) | 1124(89.6) | 17.205 | 0.710(0.372-1.354) | .299 |
| Family of HBV | 143(11.4) | 1111(88.6) | 1.319 | 3.741(1.143-12.248) | **.029** |
| Infant born to infected mothers | 196(15.6) | 1058(84.4) | -.633 | 0.531(0.102-2.775) | .453 |
| Constant | | | 2.632 | 13.898 | .004 |

*Prevalence of hepatitis b infection in regards to age*: The age of acquiring HBV infection is the major determinant of the incidence and prevalence rates. In this study, HBsAg infection was not significantly associated with age (P = 0.223) even though HBsAg was detected with the highest prevalence among women aged between 24 and 30 years. This finding is in concordance with similar studies by Pindar *et al.* (2023) in Gombe, Batitiye *et al*. (2019) in Gambia and Aba *et al.* (2016) in Nigeria who reported highest prevalence rate of HBV among age groups 21-30 years, 27 30 years and 21-25years respectively This finding contrasts the findings of Al-Ismaili *et al*. (2022) in Oman *et al*. (2021) in Northwest Ethopia and Hope *et al*. (2021) in Nigeria who recorded the highest HBsAg prevalence rates among women in age groups 31-40 years, 45-49 years and 32-40 years , respectively. This difference may be associated with higher sexual activities within these age groups. In contrasts with this finding, others studies showed that the seroprevalence of HBV increases with age in both pregnant women and general population (Mac *et al*. 2019; Mustapha *et al.* 2020). The effects of age may be correlated with the progressive loss of protective antibody levels against HBV over time.

*Prevalence of hepatitis b infection in regards to* trimester: In relation to trimester, women in their second trimester reported HBV highest prevalence of 1.9% which concurred with a similar study carried out in Gombe, by Pindar *et al*. (2023) who reported HBV highest prevalence of 2.29% among pregnant women in Gombe, Gombe State, Nigeria. Moreover, though with higher prevalence's Ndako *et al*. (2021) and Shedura *et al.* (2023) reported highest prevalence of HBV in a similar study among women in their second trimester of pregnancy in north central Nigeria and Tanzania as 22.2% and 19.1% respectively. However, the report by Mac, Suleiman and Airiohuodion, (2019) was not consistent with the finding of this work who reported a highest HBV prevalence of 39.2% among pregnant women in their third trimester of their gestational period in comparison to those in first trimester (18.2%) and second trimester (15.3%). Additionally, Kwadzokpui *et al*. (2020) also reported that pregnant women who were in their third trimester had a higher prevalence of 4.55% than their counterparts in their second trimester with prevalence of 3.44%. The high prevalence of hepatitis B among the second trimester may be due to the fact that most pregnant women attend ANC in their early second trimesters.

*Prevalence of hepatitis b infection in regards to parity*: In the study, parity was identified as a risk factor for HBV infection with significant association (p=0.02). Multigravidae had the highest HBV prevalence of 38.6% in the study which agrees with the result of Kampe *et al.* (2023) who reported a highest prevalence of 7.7% in multigravidae among pregnant women attending antenatal care at public hospitals in Borena Zone, Southern Ethiopia. In addition, Kwadzokpui *et al.* (2020) reported that those that had given birth to more than five children (grand multiparous) presented with the highest prevalence (10.00%) of the disease which was similar to the highest prevalence (11.99%) in multiparous women as reported by Shedura, Mchau and Kamori, (2023). Contrary to the report in the study, Mustapha *et al.* (2020) and Asaye *et al.* (2021) reported highest prevalence of HBV among the primigravidae as 9.7% and 4.5% respectively. The highest HBV prevalence reported in the study among multigravidae may be attributed to increased risk of HBV infection through sexual exposure and risky sexual behaviours. Additionally, gravidae increase with age which lowers innate immunity against active infection with acute HBV which could be self-resolved among younger ages with stronger immunity. Moreover, a high degree of parity is associated with an increased risk of HBV infection (Khalid *et al.*, 2022). This may be due to a lack of continuous screening, lack of personal hygiene, and limited access to health services by pregnant women.

*Prevalence of hepatitis b infection in regards to occupation*: With regards to occupation, the result of the study revealed highest prevalence of those infected with HBV among housewife (58.7%) and least among unemployed (2.2%) with significant association (p=0.023). This report corroborates with report documented by Mac, Suleiman and Airiohuodion, (2019), who reported highest prevalence of HBV (22.7%) among house wives and least prevalence among farmers (5.3%). On the other hand, Pindar *et al.*

(2023) reported highest prevalence of HBV among business-oriented women (7.84%), followed by civil servants (2.48%), while the least was observed among the house wives (1.25). Also, Bittaye *et al.* (2019) observed highest prevalence of HBV among the traders (20.4%), followed by the civil servants (13.4%), farmer (10.0%) and the least among the unemployed (5.8%). However, inconsistent with the result in the current study, Kampe *et al.* (2023) reported highest HBV prevalence of 11.1% among employee and least among merchant (7.8%). The high prevalence among housewife may be due to a lack of continuous screening, lack of personal hygiene, limited access to health services and lack of awareness as they are usually saddled with domestic activities.

*Prevalence of hepatitis b infection in regards to education level*: With respect to educational level, HBV prevalence were reported as 0.4%, 2.0% and 0.8% for primary, secondary and tertiary respectively without significant association ($p< 0.05$). This report concord with the report of Kwadzokpui *et al.* (2020) who observed that pregnant women who had secondary level of education recorded the highest HBV prevalence of 5.66% compared to those who had basic education (2.86%) and the tertiary education (3.13%). Similarly, Olakunde *et al*. (2021) reported HBV prevalence of 7.11% among pregnant women with secondary school level of education and 6.94% among primary school level of education. Incompatible with the current study, Mustapha *et al.* (2020) reported no HBV prevalence among pregnant women with tertiary education, while the highest prevalence was observed among those with primary level education (6.2%). Moreover, Ndako *et al. (*2021) and Asaye *et al. (*2021) observed highest prevalence of 13.2% and 6.6% among those without formal education respectively. Generally, the pregnant women with high educational level were positively associated with increased income, which is an important factor for accessibility of high-quality medical services. Moreover, educationally disadvantaged women could be more marginalized and vulnerable in societies compared with highly educated people. This may explain the significantly lower prevalence among those who had higher education compared to the less-educated women (Olakunde *et al*., 2021).

*Attitudes of pregnant women towards hepatitis b Infection***:** Attitudes towards HBV were assessed by asking eight questions listed in Table 2. Each question was labeled with good or poor attitude. A score of 1 was given to good while 0 was given to bad attitude with a score range of 0 to 8. The scale classified attitude as positive with $\leq 5$ and negative $\leq 5$. From question 1 to 5, yes answer is a good attitude and no is a bad attitude while from question 6-8, no answer is a good attitude while yes is a bad attitude. In the current study, good attitude of 73.9% toward HBV was reported among pregnant women which corroborates 76.8% in Malaysia (Abdi & Salleh, 2019). Similar studies were conducted in Saudi Arabia, Vietnam and China which documented a higher rate of good attitudes of 80.1%, 86% and 89% (Al-Essa *et al.,* 2020; Hang *et al.* (2019) and Tran, Boggiano and Nguyen, (2018) respectively. In addition, a study conducted in Ghana showed a positive attitude of 65.2% toward HBV among pregnant women attending antenatal clinic in the Kumasi Metropolis (Ivy *et al*. 2020) which corroborates the result in the current study. However, the result of good attitudes toward HBV recorded in the study slightly contradicts the findings of Mulat *et al*. (2020), Gebrecherkos *et al.* (2020) and Bohsas *et al*. (2023) who found a lower positive attitude of 56.4%, 54% and 52.4% among similar study participants respectively. More so, Belete *et al.* (2022) reported a positive attitude of 40.3% in Ghion Specialized Hospital, Bahir Dar. The overall 73.9% positive attitudes reported in this study could be attributed to the implementation of universal screening of HBV during ANC in all ward head PHCCs in Yola north local government area, Adamawa State as recommended by world health organization (Brook *et al.* 2018).

Among the attitudes-related factors toward HBV examined in the study, screened for HBV (AOR=0.349; 95%CI= 0.121-1.007; P=0.052), can get HBV (AOR=0.107; 95% C.I =0.017-0.660; P=0.016) and people with HBV are discriminated in the society (AOR=3.071; 95%CI= 1.508-6.253; P=0.002) were significantly associated with attitudes towards HBV infection. More than 82% of pregnant women sad that they are vaccinated against HBV which sharply contrasts 2.8% reported among similar study group in Northwest Ethopia (Gebrecherkos *et al*., 2020). Out of the pooled 1031 pregnant women vaccinated, 44(3.4%) were positive for HBV while 8(0.8%) was recorded among those that were not vaccinated despite evidence that vaccination remains the best tool for the prevention and elimination of HBV epidemics in poor vaccination coverage in HBV endemic regions (Choisy *et al*., 2017).

*Risk factors associated with hepatitis b infection among pregnant women:* Regarding risk factors associated with HBV transmission in the study, history of blood transfusion, alcoholism, multiple sex partners, use of sharp object, history of surgical procedures and infants born to infected mothers revealed insignificant association with HBV ($P>0.05$). This report is contrary to a similar study who found multiple sexual partners (AOR = 2.5; 95% CI: 1.604–3.901), family history of HBV (AOR = 2.62; 95% CI: 1.239–5.547), and sharing sharp materials (AOR = 3.02; 95% CI: 1.87–4.87) were factors associated with increased risk of HBV infection (Tesfu *et al.* 2023). However, in the study, family history of HBV was significantly associated with HBV infection (AOR =

3.741; 95%CI=1.143-12.248; P=0.029). This is in line with similar studies reported from Ethiopia (Mohammed *et al.,* 2022), Rwanda (Makuza *et al.* 2019), and South Brazil (Pereira *et al.* 2017). This might be due to a lack of understanding about HBV transmission methods and, the sharing of different personal and household items within the family, vertical transmission, and unsafe sexual practices. In addition, factors significantly associated with HBV infection in other studies were not found in this study. The lack of significance for other characteristics may be due to the small number of HBV positive cases that could conceal significant results in the logistic regression.

*Conclusion:* Hepatitis B infection was prevalent among the pregnant women studied with intermediate endemicity according WHO criteria for endemicity classification. There was generally good attitude of pregnant women towards HBV infected patients but few proportions of the participants stated that they avoid HBV patients, discriminate them in the society and also fear cost of treatment of the disease. Therefore, mandatory incorporation of Hepatitis b screening for all pregnant women during first antenatal visit will help in the detection of hepatitis b infection and early treatment to reduce vertical transmission of the disease.

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