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# Hepatitis B infection and risk factors among pregnant women and their male partners in the Baby Shower Programme in Nigeria: a cross-sectional study

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## Abstract

**OBJECTIVES** To determine the population prevalence and determinants of hepatitis B (Hep B) status, and status discordance, among pregnant women and their male partners in Nigeria.

**METHODS** Cross-sectional study assessing the seroprevalence of Hep B virus in a cohort of 16 920 pregnant women and their male partners in northcentral Nigeria. Rapid HBsAg antibody test was used for Hep B diagnosis. Demographic, socio-economic and behavioural information was collected through interviewer-administered questionnaires and evaluated as determinants of Hep B status and couple status discordance using logistic regression.

**RESULTS** Of 16 920 participants who had a Hep B test result, 6750 couples and 1316 discordant couples were identified. The prevalence of Hep B among all participants was 10.9%, with lower prevalence among pregnant women (10.2%) than their male partners (11.9%),  $P < 0.001$ . The prevalence of Hep B sero-discordance among couples was 19.5% (1316/6750). Younger age, prior Hep B testing and a prior positive Hep B test increased the odds of Hep B infection while being a woman decreased the odds of Hep B among all participants, and among couples. Furthermore, polygamy (adjusted odds ratio [AOR]: 1.49, 95% confidence interval [CI]: 1.19–1.87), prior Hep B testing (AOR: 2.38, 95% CI: 1.14–4.97) and a prior positive Hep B test result were significant determinants of status discordance among the participating couples.

**CONCLUSION** The prevalence of Hep B among pregnant women and their male partners in northcentral Nigeria is high. A large-scale intervention is required to reduce Hep B prevalence in this setting.

**keywords** Hepatitis B, prevalence, pregnant women, sexual partners, Nigeria

Sustainable Development Goals (SDGs): 3.1 + 3.2 + 3.3 + 3.8

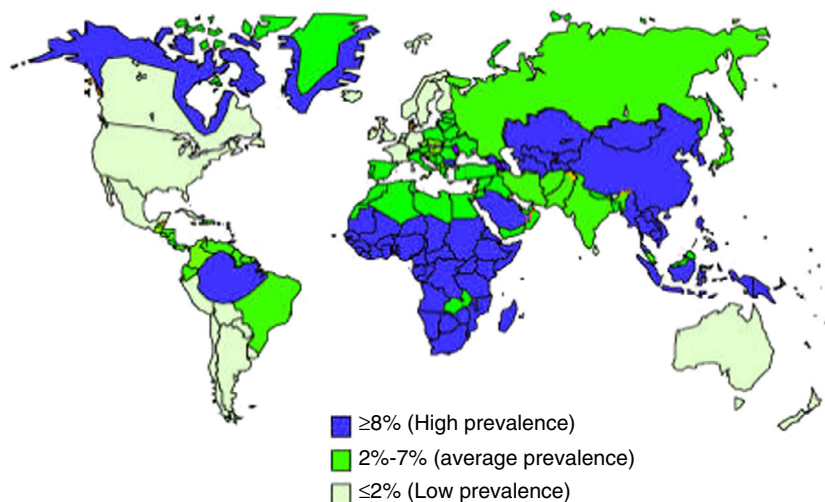
## Introduction

Hepatitis B viral infection (Hep B) can take an acute pathway leading to liver tissue necrosis, or a chronic pathway leading to cirrhosis. Hep B may exist in an asymptomatic state in some individuals (carrier state) [1] and is a well-documented risk factor of hepatocellular carcinoma [1–4].

In 2015, the global prevalence of Hep B was estimated by WHO at 3.5%, affecting approximately 257 million individuals predominantly (68%) in the African and West Pacific regions (Figure 1). WHO estimated a death toll of 887 000 in 2015, highlighting cirrhosis and hepatocellular carcinoma as the main causes of death [5].

The community prevalence of Hep B infection varies across African countries, ranging from 3.9% in Rwanda [6] to 18.7% in Guinea Bissau [7]. A meta-analysis

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**Figure 1** World map depicting the prevalence of hepatitis B, and classifying regions in three sub-groups (high, average and low prevalence) [5].

(34 376 participants) estimated Hep B prevalence at 13.6% in Nigeria [8]; almost four times the global Hep B prevalence [5]. Similarly, results of a national Hep B random-testing survey estimated the Hep B prevalence in Nigeria at 12.2% [9].

Vertical transmission from mother to child is one of the major routes of Hep B infection in several countries with high prevalence of Hep B, [10–15], making it critical to test pregnant women for Hep B. The prevalence of Hep B among pregnant women attending antenatal clinics (ANC) in Nigeria ranges from 3.5% to 14.1% [8, 16–21]. However, this reflects women who receive care in hospital ANCs, and the 2017 African Population and Health Research Centre (APHRC) study estimated that less than half (4.6 million) of all pregnant women (9.2 million) in Nigeria receive care at ANCs annually [22]. These data suggest that Hep B prevalence estimates exclude women who do not receive care at ANCs, including those who give birth at home and use traditional birth attendants.

Among the general population, Hep B community screening is more effective at testing uptake and acceptance than hospital-based screenings [23, 24]. Our previous studies have demonstrated that community-based health screening programmes were more effective than hospital-based screening as they included both women who visited and do not visit ANC [25, 26]

In low and average prevalence regions where Hep B is endemic (Figure 1), sexual contact is a major contributor to the high incidence of Hep B among adults and adolescents. [27]. There is a high risk of Hep B transmission among heterosexual couples (horizontal transmission), particularly as sexual contact without the use of condoms

is a well-documented risk behaviour for Hep B transmission [28–30]. Furthermore, large case control studies of expectant heterosexual couples found that Hep B status discordance (one partner Hep B positive and the other Hep B negative) was common [31, 32]. A significant limitation to these previous studies is their reliance on hospital-based approaches to recruit subjects, which may exclude non-hospital-seeking couples. In addition, these studies have not linked Hep B couple discordance with demographic and socio-economic factors, which may be important contextual factors to inform targeted efforts for Hep B screening and linkage to care.

Our objectives for this study were to (1) determine the population prevalence of Hep B among a community sample of pregnant women and their male partners; (2) examine demographic and socio-economic determinants of Hep B-positive status; and (3) identify demographic and socio-economic determinants of Hep B status discordance among expectant couples.

## Methods

### Study setting, design and participants

We conducted a cross-sectional study among a cohort of pregnant women and their male partners (expectant couples), who participated in the Healthy Beginning Initiative (HBI) programme in Benue State, Nigeria.

Benue State has 23 local government areas (LGAs) with a projected population of 5,741,815 in 2016 based on the 2006 population estimates [33], of which about 70% are farmers. A total of 80 churches (Catholic and

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'Nongu u Kristu u i Ser u sha Tar' [NKST] translated as 'Universal Reformed Christian Church') in 80 communities across 12 LGAs in Benue State participated in this programme, from June, 2016 to October 2018. Benue State has the second highest prevalence of HIV in Nigeria, at 4.9% [34].

The HBI programme provides an integrated, feasible and culturally adaptive platform for HIV/Hep B screening, linkage and follow-up of pregnant women, aiming to identify, treat and retain women in care throughout their pregnancy. Details of the HBI programme have been described elsewhere [25, 35]. In brief, HBI consists of three components that are all congregation-based: (1) Prayer sessions, in which every Sunday at the end of the church service, the priest or pastor announced for pregnant women and their male partners to come out for prayers. He prayed for a healthy pregnancy, safe delivery and encouraged pregnant women to seek antenatal care at a health facility. (2) Baby showers were organised as a reception and health fair in churches, during which health education on early antenatal care, importance of the integrated screening tests for pregnant women, good nutrition, skilled birth attendance and immunisations were provided. Onsite integrated laboratory testing for HIV, Hep B virus and sickle cell genotype were conducted for pregnant women and their male partners. Male partners received a 'mama pack' to present to their female partners as an expression of love and support during the pregnancy. (3) Baby receptions were organised six to eight weeks post-delivery, for women who participated in the baby shower, where women also completed a post-delivery questionnaire to ascertain place of delivery and pregnancy outcome. Enhanced nutrition and immunisation education were provided. This also offered an opportunity for post-delivery linkage to care for women as needed.

### Laboratory testing

During the baby showers, trained lay health workers collected 2 millilitres of whole blood from participants using sterile procedures. HIV and HBV rapid tests were performed onsite, while the remaining blood sample was transported in cold boxes with ice packs to a central laboratory for sickle cell genotype testing. The Hep B assay was conducted using plasma.

Global rapid HBsAg antibody test strips, manufactured by Model Laboratories, USA, and validated and approved by the National Agency for Food and Drug Administration and Control, Nigeria (NAFDAC Reg No: 03-1192) [36], were used to test for Hep B surface antigen in plasma. This test has a relative sensitivity

of > 99.9% and a relative specificity of 99.4%. During testing, the plasma specimen migrates upwards on the membrane of the test strip to react with the anti-HBsAg antibody on the test region of the strip to produce a coloured line. Participants with a Hep B-positive result were referred to a health facility for care.

### Questionnaire administration

Trained programme assistants who had a minimum of a Bachelor's degree administered pretested semi-structured questionnaires during the baby showers individually to each pregnant woman and her partner in a private location. There were separate male and female questionnaires. Data were collected on sociodemographic characteristics, medical history and lifestyle habits of the participants.

Sociodemographic data included age, sex, marital status, highest level of education, occupation, monthly income, languages spoken, distance to health facility and number of people living in the household. Medical history data included past history of previous surgery, and past history of Hep B virus test. Lifestyle habits including tobacco, alcohol and other substance use were also collected.

### Ethical considerations

This study was approved by the Health Research Ethics Committee of the University of Nigeria Teaching Hospital, Enugu, Nigeria. Although consent was not needed to participate in the baby showers, written informed consent was obtained from the participants for laboratory tests and questionnaire data collection.

### Statistical analysis

Descriptive statistics performed include frequencies and proportions for categorical variables, and median and interquartile range for continuous variables. Chi-squared test was used to determine variables associated with Hep B status. Variables which had a *P*-value of  $\leq 0.2$  in the chi-squared analyses were included in the logistic regression analyses. Bivariable and multivariable logistic regression analyses were performed to identify determinants of Hep B status and of Hep B status discordance. Odds ratios with the 95% confidence intervals (CI) were estimated from multivariable logistic regression models. The level of statistical significance was set at  $P < 0.05$  for all analyses.

Only women whose male partners participated in the HBI programme were considered in the analysis as

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'couples'. Discordant couples were defined as two heterosexual partners with contrary Hep B surface antigen results. Polygamous men were classified as discordant if their status differed from that of any of their wives. All statistics were conducted using SPSS version 23 and Microsoft Excel 2019.

## Results

### Characteristics of the participants

A total of 16 934 individuals (10 168 women and 6766 men) participated in the HBI programme. Of these, 99.9% (16 920 participants – 10 167 women and 6753 men) had a valid Hep B result and were included in the analyses. We report on results of these 16 920 participants. The median age of the participants was 26 years (interquartile range [IQR] = 22 to 31 years). Women were younger than men (median - 24 years, IQR – 20 to 28 years for women; median – 31 years, IQR – 26 – 31 years for men;  $p < 0.001$ ). The majority of participants were married (99.3%) and most participants (88.4%) were in the lowest monthly income category (₦0–20 000 ~ \$0–\$55). (Table 1) describes the participants' characteristics in more detail.

Among 16 920 participants, 6750 couples were identified, consisting of 13 643 individuals. No woman reported having more than one partner or husband. The prevalence of polygamy (men with more than one woman as a partner) was 2.03% (137/6750), and the largest polygamous group was one man with three wives.

### Prevalence of Hep B

The prevalence of Hep B within the entire sample ( $n = 16 920$ ) was 10.9% (1836 cases); (Figure 2). Hep B was less prevalent among pregnant women at 10.2% (1032/10 167) than their male partners at 11.9% (804/6753);  $\chi^2 = 12.93$ ,  $P$ -value  $< 0.001$ . Hep B was most common among the age group 21–31 years (1099 cases / 9410; 11.7% prevalence).

Among the couples, a Hep B prevalence of 11.1% (1514/13 643) was recorded, (cases for men = 804, cases for women = 710); (Figure 2). The prevalence of Hep B sero-discordance among couples was 19.5% (1316/6750), 10.5% (708/6750) among men and 9.0% (609/6750) among women.

### Determinants of Hep B status among all participants

Bivariate analyses showed age, sex, number of adults living in the household, having tested for Hep B in the past,

**Table 1** Characteristics of men and women who participated in the HBI programme in Benue, Nigeria

Variable	Frequency (N = 16 920)	Percentage
Age Group		
≤20 years	3366	19.9
21–31 years	9410	55.6
32–42 years	3227	19.1
43–53 years	665	3.9
>53 years	252	1.5
Sex		
Women	10 167	60.1
Men	6753	39.9
Marital Status		
Divorced	5	0.03
Married	16 802	99.3
Separated	15	0.1
Single	29	0.2
Widowed	69	0.4
Number of spoken Languages		
1	8642	51.1
2	7465	44.1
>2	813	4.8
Level of Education		
No formal education	2182	12.9
Completed primary	4227	25
Completed junior secondary	4060	24
Completed senior secondary	4578	27.1
Some post-secondary	791	4.7
Completed post-secondary	1077	6.4
Missing	5	0.03
Income		
₦0–20 000	14 963	88.4
₦20 001–50 000	1421	8.4
₦50 001–100 000	396	2.3
Above ₦100 000	133	0.8
Missing	7	0.04
Other adults in household group		
0–2	6531	38.6
3 to 5	6279	37.1
6 to 8	2515	14.9
>8	1520	9
Missing	75	0.4
Previous surgery		
No	15 362	90.8
Yes	1557	9.2
Missing	1	0.01
Tested for Hep B in the past		
No	11 523	68.1
Yes	5392	31.9
Missing	5	0.03
Past Hep B test result		
Not tested before	11 376	67.2
Negative	4852	28.7
Not sure/Don't know	258	1.5
Positive	423	2.5
Missing	11	0.1

**Table -0001** (Continued)

Variable	Frequency (N = 16 920)	Percentage
Alcohol consumption		
Daily	863	5.1
Monthly	611	3.6
Weekly	1541	9.1
Occasionally	2971	17.6
Never	10 932	64.6
Missing	2	0.01
Tobacco use		
Daily	1396	8.3
Monthly	49	0.3
Weekly	191	1.1
Occasionally	234	1.4
Never	15 047	88.9
Missing	3	0.02
Substance use		
No	16 618	98.2
Yes	299	1.8
Missing	3	0.02

The percentage values are approximated and may not necessarily sum up to 100%. All women were pregnant.

having received a Hep B test result in the past, and frequency of substance use were associated with Hep B status (Table 2).

Results of the multivariable analysis show that the odds of Hep B infection were higher among younger participants than those older than 53 years. Individuals 21 to 31 years had the highest odds of Hep B infection compared with those older than 53 years (adjusted odds ratio [AOR]=4.5, 95% confidence interval [CI] = 2.2–9.3). Women had 34% lower odds of Hep B infection than their male partners (AOR = 0.66, 95% CI = 0.58–0.75). Compared with households which had 0–2 other adults, participants in households with 3 to 5 adults had higher odds of Hep B infection (AOR = 1.149, 95% CI = 1.022–1.292). The odds of Hep infection were 13 times higher among individuals who had been tested for Hep B in the past (irrespective of the test outcome). Alcohol and substance use were not determinants of Hep B status (Table 2).

#### Determinants of Hep B status among couples

Determinants of Hep B status among all couples were similar to those of all participants, with the addition of level of education. The odds of Hep B infection was higher in younger age groups compared to those > 53 years of age, with age group 21–31 years

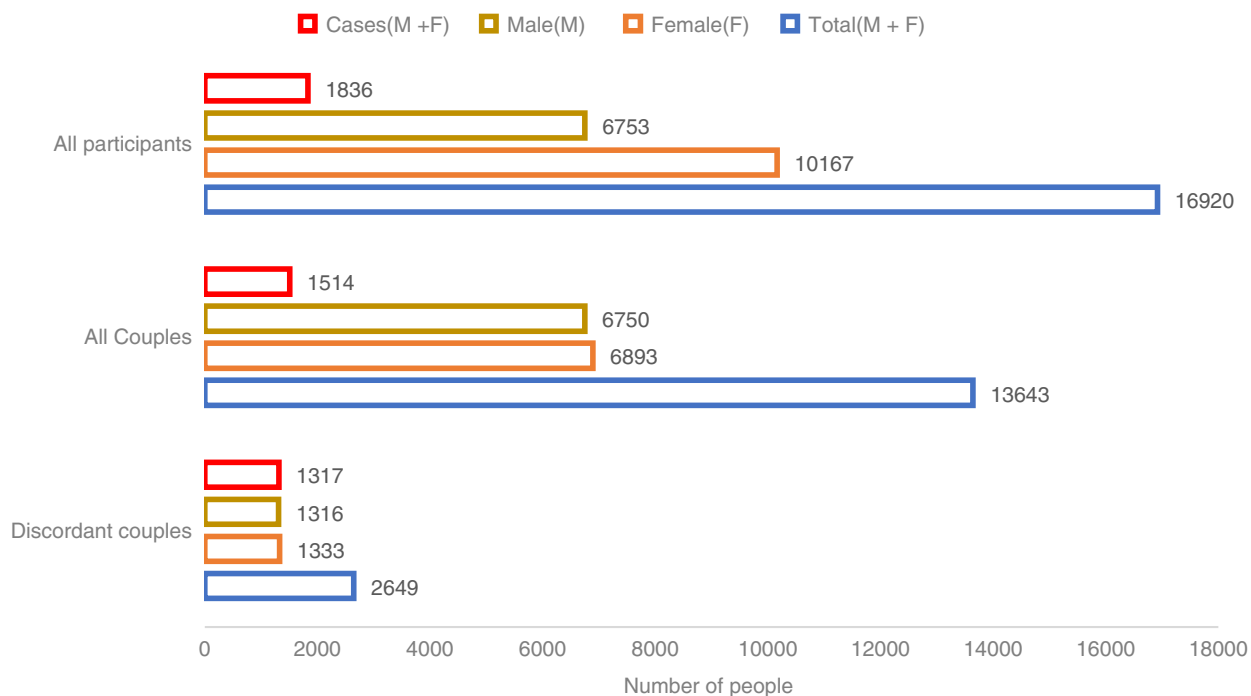
having the highest odds of infection (AOR = 4.6, 95% CI = 2.2–9.5). Women had 30% lower odds of Hep B infection than men (AOR = 0.70, 95% CI = 0.61–0.80). The odds of Hep B infection increased with decreasing level of education, with only those who had completed junior secondary education reaching statistical significance (AOR = 1.309, 95% CI = 1.013–1.692). Individuals who had never tested for Hep B had lower odds of Hep B infection than those tested for Hep B previously (Table 3).

#### Determinants of Hep B status discordance among couples

Polygamy, having tested for Hep B in the past and having received a Hep B result in the past were significant determinants of Hep B status discordance. The odds of Hep B status discordance was higher among polygamous couples (AOR = 1.5, 95% CI = 1.19–1.87). Couples who had taken Hep B test in the past also had higher odds of being discordant (AOR = 2.382, 95% CI = 1.141–4.971) (Table 4).

#### Discussion

Our study found a high Hep B prevalence of 10.9% among pregnant women and their male partners. This implies that the estimated Hep B burden in Benue State, Nigeria, would have been approximately 621 300 by 2016, considering the population growth forecasted by the Nigerian National Population Commission (5 741 815), extrapolated from the last nationwide census conducted in 2006. [37] This figure may be higher considering subsequent population growth between 2016 and 2018 when this study was conducted. Our study also suggests a high prevalence of Hep B among pregnant women (10.2%) (as WHO classifies any prevalence  $\geq$  8% as high [27]). Although other hospital-based Hep B screening studies among pregnant women had smaller sample sizes compared to our community-based study, the proportions obtained were not different 9.7% [38] and 11% [17] for Benue State. Having such a high prevalence of Hep B infection among pregnant women (10 out every 100) presents a serious public health threat, given that most Hep B infections in endemic regions occur through vertical transmission [39], and some studies have reported vertical transmission rates as high as 51.6% in Nigeria [40]. It is highly likely that several cases Hep B among pregnant women go undetected as routine screening of Hep B among expectant women at ANCs is not yet practiced in Nigeria [40]. There is an urgent need to fund and implement free or subsidised Hep B screening programmes for pregnant women in hospitals and in

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**Figure 2** Summary data showing hepatitis B cases in each group (red) with the total number of females and males who participated in the HBI programme in Benue State.

communities. Furthermore, male partners of pregnant women should be included in such screening interventions, as we found a higher Hep B prevalence among male partners (11.9%).

Although maternal Hep B infection does not translate to infant infection, studies in endemic regions have shown an estimated 90% risk of perinatal Hep B transmission from infected mother to child [41]. In addition, Hep B infection in infancy leads to chronic hepatitis in 80–90% of cases, with the risk declining with increasing age [42]. However, there is evidence that administering Hep B immunoglobulin (Hep B Ig) at birth and a birth dose of Hep B vaccine reduce the risk of perinatal transmission of Hep B by approximately 94% [43]. Screening pregnant women informs early Hep B Ig and Hep B vaccine interventions within the first 12 hours of birth as recommended by WHO [44]. Furthermore, maternal antiviral therapy started at 28–32 weeks' gestation, as an adjunct to birth dose of Hep B Ig and Hep vaccine, has been shown to significantly reduce perinatal transmission of Hep B [45].

Some studies that similarly screened for Hep B (within moderate and high prevalence regions) among pregnant women and their partners, couples who planned to conceive after marriage, and couples who attend a fertility

clinic in a tertiary hospital also showed a higher prevalence in men than women (4.6% against 6.8%; 4.4% against 6.3%; and 3.1% against 6.3%, respectively) [32, 46, 47]. By screening and treating couples infected with Hep B, we can more effectively reduce both vertical and horizontal transmission.

Polygamy was a significant determinant of Hep B status discordance suggesting that the risk of discordance is increased with having multiple sexual partners. This has implication for men in this study as only they reported multiple sexual partners. This finding correlates with other studies conducted among ANC women in other countries [48–50] and in Nigeria [51]. Furthermore, our study suggests that women were less at risk of infection with Hep B than men. This finding is consistent with findings from other studies, which show that men are two times more likely to be infected with Hep B than women [52]. Possible explanations for this association are the stronger immune responses of women to viruses and vaccination than men, and the differential effects of sex hormones on immune responses to viruses [53]. Estrogens have been found to have immune-stimulating effects while androgens have immune-suppressing effects.

We found that there was no association between Hep B status and alcohol consumption. Although some studies

C. Talla *et al.* Population Hepatitis B prevalence in Nigeria**Table 2** Logistic regression model showing the predictors of Hepatitis B infection in the full sample of women and men who participated in the HBI programme in Benue, Nigeria

Variable	N = 16 817		Crude Odds Ratio	P-value	95% CI		Adjusted Odds Ratio†	P-value	95% CI	
	Positives n (%)	Negatives n (%)			Lower	Upper			Lower	Upper
<b>Sex</b>										
Men	804 (11.9)	5949 (88.1)	1.00	-	-	-	1.00	-	-	-
Women	1032 (10.2)	9135 (89.8)	0.836	0.000	0.758	0.922	0.658*	<0.001	0.578	0.751
<b>Age group</b>										
≤20	345 (10.2)	3021 (89.8)	3.483	0.001	1.707	7.106	4.287*	<0.0001	2.070	8.880
21–31	1099 (11.7)	8311 (88.3)	4.033	0.0001	1.989	8.179	4.539*	<0.0001	2.213	9.311
32–42	329 (10.2)	2898 (89.8)	3.463	0.001	1.697	7.067	3.564*	0.001	1.732	7.338
43–53	55 (8.3)	610 (91.7)	2.750	0.009	1.291	5.859	2.672*	0.012	1.242	5.752
>53	8 (3.2)	244 (96.8)	1.00	-	-	-	1.00	-	-	-
<b>Other adults in household grp</b>										
0–2	663 (10.2)	5868 (89.8)	1.00	-	-	-	1.00	-	-	-
3 to 5	720 (11.5)	5559 (88.5)	1.146	0.017	1.025	1.282	1.149*	0.020	1.022	1.292
6 to 8	272 (10.8)	2243 (89.2)	1.073	0.353	0.924	1.246	1.033	0.686	0.883	1.209
>8	172 (11.3)	1348 (88.7)	1.129	0.180	0.945	1.349	1.050	0.613	0.869	1.268
<b>Tested for Hep B in the past</b>										
Yes	735 (13.6)	4657 (86.4)	1.497	<0.001	1.355	1.654	13.072*	0.001	2.972	57.501
No	1099 (9.5)	10 424 (90.5)	1.00	-	-	-	1.00	-	-	-
<b>Past Hep B test result</b>										
Never tested before	1097 (9.6)	10 279 (90.4)	0.053	0.00	0.043	0.066	0.680	0.613	0.152	3.035
Negative	435 (9.0)	4417 (91.0)	0.049	0.00	0.039	0.062	0.049*	<0.0001	0.039	0.061
Not sure	21 (8.1)	237 (91.9)	0.044	0.00	0.027	0.072	0.085*	<0.0001	0.049	0.145
Positive	282 (66.7)	141 (33.3)	1.00	-	-	-	1.00	-	-	-
<b>Alcohol consumption</b>										
Never	1180 (10.8)	9752 (89.2)	1.00	-	-	-	1.00	-	-	-
Daily	104 (12.1)	759 (87.9)	1.132	0.254	0.915	1.402	0.989	0.928	0.778	1.258
Weekly	161 (10.4)	1380 (89.6)	.964	0.681	0.810	1.147	0.853	0.115	0.701	1.039
Monthly	65 (10.6)	546 (89.4)	0.984	0.904	0.755	1.281	0.870	0.338	0.655	1.156
Occasionally	326 (11.0)	2645 (89.0)	1.019	0.781	0.894	1.160	0.969	0.661	0.840	1.117
<b>Substance use frequency</b>										
Daily	28 (15.5)	153 (84.5)	1.508	0.047	1.005	2.263	1.444	0.094	0.940	2.218
Weekly	3 (6.3)	45 (93.8)	0.549	0.315	0.171	1.769	0.559	0.332	0.173	1.812
Monthly	3 (18.8)	13 (81.3)	1.901	0.316	0.541	6.679	2.125	0.246	0.595	7.586
Occasionally	3 (5.6)	52 (94.4)	0.485	0.223	0.151	1.554	0.473	0.229	0.140	1.602
Never	1798 (10.8)	14 814 (89.2)	1.00	-	-	-	1.00	-	-	-

†Odds ratio adjusted for age group, sex (all women are pregnant), education, other adults in household, tested for Hep B in the past, past Hep B test result, alcohol consumption, and substance use frequency.

\*Statistically significant.

suggest an association between Hep B–positive status and alcohol consumption among pregnant women [50], the adjusted ORs in our study show that individuals who reported negative current alcohol use (within last 30 days) had a higher odds of being Hep B positive, when compared to other groups.

Our finding of high prevalence of Hep B discordance among couples has been reported elsewhere [32]. However, in this study which aimed to prevent mother-to-

child transmission of Hep B by screening both women and their male partners, nearly all couples (93.2%) were Hep B discordant.

A notable strength of this study is the large sample size of the pregnant women and their male partners included in the study. To the best of our knowledge, this is the largest study to report on Hep B among pregnant women in Nigeria till date. Additionally, this study was population-based and used a community approach to provide Hep B



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testing to pregnant women and men who may not seek hospital care. The Hep B screening was also provided at a location (church) where majority of Nigerians visit at least once a week. The study has a few limitations. Although our study was population-based and included pregnant women and men who live in both urban and rural areas, most of the participants lived in rural areas. However, our findings are similar to results obtained in an urban area in the same setting [17]. Even though this study was conducted in churches, the baby shower programme was open to everyone to participate in irrespective of their religion. Although the participants were primarily church attendees and some of their responses

**Table 3** Multivariable logistic regression analysis showing predictors of Hepatitis B infection among all couples who participated in HBI programme in Benue, Nigeria (significant variables only)

N = 13 584				
Variable	Adjusted Odds Ratio†	P-value	95% CI	
			Lower	Upper
Age group				
≤20	4.264*	<0.001	2.043	8.898
21–31	4.602*	<0.001	2.236	9.473
32–42	3.463*	0.001	1.677	7.152
43–53	2.518*	0.019	1.166	5.437
>53	1.00	-	-	-
Sex				
Men	1.00	-	-	-
Women	0.697*	<0.001	0.610	0.796
Level of education				
No formal education	1.175	0.295	0.868	1.591
Completed primary	1.160	0.272	0.890	1.511
Completed junior secondary	1.309*	0.039	1.013	1.692
Completed senior secondary	1.129	0.338	0.881	1.446
Some post-secondary	0.942	0.734	0.670	1.327
Completed post-secondary	1.00	-	-	-
Tested for Hep B in the past				
Yes	1.00	-	-	-
No	0.071*	0.001	0.016	0.320
Past Hep B test result				
Positive	1.00	-	-	-
Never tested before	0.666	0.602	0.145	3.069
Negative	0.043*	<0.001	0.033	0.056
Not Sure	0.083*	<0.001	0.045	0.155

†Odds ratio adjusted for age group, sex (all women are pregnant), education, other adults in household, tested for Hep B in the past, past Hep B test result, alcohol consumption, and substance use frequency.

\*Statistically significant.

**Table 4** Multivariable logistic regression analysis showing predictors of Hepatitis B sero-discordance among expectant couples in Benue, Nigeria

N = 13 584				
Variable	Adjusted Odds Ratio†	P-value	95% CI	
			Lower	Upper
Age group				
≤20	1.098	0.602	0.772	1.564
21–31	1.174	0.357	0.834	1.652
32–42	0.946	0.755	0.667	1.341
43–53	0.913	0.654	0.615	1.356
>53	1.00	-	-	-
Polygamy				
No	1.00	-	-	-
Yes	1.492*	0.001	1.189	1.872
Level of education				
No formal education	1.004	0.972	0.807	1.249
Completed primary	1.078	0.447	0.888	1.309
Completed junior secondary	1.103	0.322	0.908	1.340
Completed senior secondary	1.096	0.341	0.908	1.323
Some post-secondary	1.171	0.219	0.910	1.507
Completed post-secondary	1.00	-	-	-
Tested for Hep B in the past				
No	1.00	-	-	-
Yes	2.382*	0.021	1.141	4.971
Past Hep B test result				
Positive	1.00	-	-	-
Never tested before	0.289*	0.002	0.134	0.626
Negative	0.129*	<0.001	0.101	0.164
Not Sure	0.157*	<0.001	0.091	0.271
Other adults in household grp				
0–2	1.00	-	-	-
3–5	1.022	0.675	0.924	1.130
6–8	1.095	0.169	0.962	1.247
>8	0.985	0.851	0.839	1.156
Alcohol consumption				
Daily	1.090	0.365	0.904	1.314
Weekly	0.910	0.228	0.781	1.061
Monthly	0.929	0.533	0.738	1.170
Occasionally	0.942	0.326	0.836	1.061
Never	1.00	-	-	-
Substance use frequency				
Daily	1.220	0.295	0.841	1.769
Weekly	0.653	0.332	0.276	1.545
Monthly	2.174	0.159	0.738	6.406
Occasionally	0.522	0.178	0.203	1.343
Never	1.00	-	-	-

†Odds ratio adjusted for age group, sex (all women are pregnant), education, other adults in household, tested for Hep B in the past, past Hep B test result, alcohol consumption, and substance use frequency.

\*Statistically significant.

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could be influenced by their faith, this paper does not report on their views and their reported history of Hep B testing is not likely to be biased because of their church attendance. We did not collect data on the sexual habits of the study participants. Nevertheless, this study provides insights into a significant public health problem for which urgent interventions are needed.

### Conclusion

The prevalence of Hep B among pregnant women and their male partners in Benue State, northcentral Nigeria, is high (10.9%). The prevalence of Hep B sero-discordance among couples in Benue State is also high. Sex, age, being tested for Hep B in the past, and having received a Hep B result in the past were significant determinants of Hep B status among the entire sample and among couples. When compared with households that had 0–2 other adults, participants in households with 3 to 5 adults had higher odds of Hep B infection. However, further research may be required to investigate this outcome. Educational level was also a significant determinant of Hep B among couples. Targeted screening and treatment should be aimed at young women less than 30 years of age, their male partners, and those who had previous Hep B-positive results.

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