

Co-infection and Risk Factors Associated with STIs among Pregnant Women in Rural Health Facilities in Nigeria: A Retrospective Study

INQUIRY: The Journal of Health Care Organization, Provision, and Financing
Volume 58: 1–9
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DOI: 10.1177/0046958021992912
journals.sagepub.com/home/inq



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Abstract

Globally, sexually transmitted infections are recognized as a public and reproductive health challenge. The study determined the prevalence, co-infection, and risk factors associated with HBV, HCV, HIV, and Syphilis infections among pregnant women receiving antenatal care in rural health facilities in Ebonyi State, Nigeria. A retrospective study was conducted from January to December 2018 in 8 primary healthcare facilities using antenatal records of all the 4657 pregnant women who attended ANC within the period. Data were analyzed using descriptive and inferential statistics with IBM SPSS statistics version 20 and hypotheses tested at $P < .05$. The findings indicated a medium prevalence of HBV (4.1%), a high prevalence of HCV (4.1%) and syphilis (1.8%), and a low prevalence of HIV (0.9%). An overall co-infection rate of 0.623% that was not significant ($P > .05$) was observed. Also, prevalence was more among the younger mothers (<20 years), those with secondary education. And the history of blood transfusion was significantly associated with HBV and HCV prevalence ($\chi^2 = 7.865$; $P = .05^*$), 11.8%. conclusively, due to medium HBV prevalence and a high prevalence of HCV and syphilis observed, attention should be paid to blood screening before transfusion by health workers. Relevant stakeholders should provide intensive health education and appropriate free treatment services particularly for younger mothers and the less educated.

Keywords

prevalence, co-infection, STIs, pregnancy, Nigeria

What do we already know about this topic?

Reports are mainly on HIV and HBV among pregnant mothers but less on HCV and Syphilis,

How does your research contribute to the field?

Our research has gone further by juxtaposing HIV, HBV, HCV, and Syphilis infections in pregnant women,

What are your research's implications toward theory, practice, or policy?

Pregnant mothers are tested for the infections but not treated except they pay for it thus there should be a policy that every pregnant mother tested be given free treatment,

Introduction

Maternal, reproductive, and child health have been wrecked by sexually transmitted infections (STIs) in all countries of the world and the burden of the problem is more in many

developing countries, including Nigeria.¹ STIs have been globally recognized as major public and reproductive health challenges^{2,3} which can result to adverse pregnancy outcomes such as stillbirth, neonatal death, intrauterine growth retardation, premature rupture of the membrane, preterm



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birth, low birth weight and prematurity, congenital deformities, infant pneumonia, blindness among other complications if either poorly treated or entirely left untreated.²⁻⁵ Some common STIs include those from Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), Syphilis, *genital herpes*, *Neisseria gonorrhoeae*, *Trichomonas vaginalis* among others.⁶⁻¹⁰ While infection like Hepatitis C virus (HCV) is a less common STI.¹¹

HBV is a potentially life-threatening liver infection and a major global public health problem.¹²⁻¹⁴ Sexually Transmitted Infections caused by hepatitis B virus (HBV) are associated with the risk of death arising from cirrhosis, liver, and non-liver cancers.^{15,16} The prevalence of HBV is highest in the World Health Organization (WHO) Western Pacific and African Regions, where 6.2% and 6.1% respectively of the adult populace is infected.¹³ According to the Federal Ministry of Health (FMOH) and WHO report, Nigeria has a high burden of HBV at a prevalence rate of 11.2%¹⁷ and is being classified as a hyper endemic area for HBV infection.¹⁸ The infection is usually spread from mother to child at delivery (perinatal transmission), or through horizontal transmission (exposure to infected blood), especially during the first 5 years of life from an infected to an uninfected child. It can also be spread by sexual intercourse with unvaccinated and multiple sex partners, needle stick injury, during medical, surgical and dental procedures, tattooing, piercing, and exposure to infected blood and body fluids, such as saliva, menstrual vaginal, and seminal fluids.^{13,19-21} Mother-to-child transmission (MTCT) of HBV is concerning because 90% of HBV-infected newborns will develop chronic infection and remain infected throughout their lives, while almost 25% of these children will die of cirrhosis, liver failure, or liver cancer later in life.¹⁹ An emerging area of opportunity to further decrease mother-to-infant transmission of HBV is the utilization of antiviral treatments during pregnancy for women at high risk of transmission.²²

Hepatitis C is a liver infection caused by the Hepatitis C virus (HCV), which can lead to serious health issues, which include liver disease, liver cancer, and eventually death. Many people with HCV infection do not show any symptoms and do not know their infection.^{11,14} Globally, the prevalence of HCV infection varies from 1.5% to 2.3% in the most affected region while the less affected varies from 0.5% to 1.0% depending on the country.¹¹ Nigeria has a high burden of HCV at

a prevalence rate of 2.0%.¹⁷ The most common modes of transmission are through exposure to small quantities of blood via injection drug use, unsafe health care, sharing needles, syringes, or other drug-injection equipment, unscreened blood transfusion, and sexual practices that result to blood exposure. HCV can as well be sexually transmitted and can be passed from an infected mother to the baby; nevertheless, these modes of transmission are less common.^{11,23,24}

HIV, one of the STIs caused by a virus that targets the immune system can be transmitted via the exchange of a variety of body fluids from infected people, such as breast milk, blood, semen, and vaginal secretions. HIV can also be transmitted from a mother to her child during pregnancy and delivery.²⁵ Worldwide, the public health effect of HIV particularly as it affects women of child-bearing age cannot be emphasized enough. Nigeria has the second biggest number of individuals living with HIV and accounts for 9% of the global HIV burden.²⁶ HIV prevalence in Nigeria has dropped from 5.1% to 3.4%²⁷ and currently 1.5%.²⁸ Nigeria also reported that 4.1% of pregnant women that were attending antenatal clinics were infected with HIV.²⁹

The venereal disease research laboratory (VDRL) test is designed to assess whether one has syphilis.³⁰ Syphilis is a STI caused by the bacterium *Treponema pallidum* which infects by penetrating the lining of the mouth or genital area.^{9,10,30,31} Syphilis is transmitted from person to person via direct contact with a syphilitic sore, anal, vaginal, or oral sex., and from infected mothers to their unborn baby.^{10,31} Worldwide, syphilis is the second most common infectious cause of stillbirth.³² In 2016 the estimated global maternal syphilis prevalence is 0.69% while in Africa it is 1.52%.³³ In 2017, among women attending antenatal care in Nigeria, 0.8% were affected.³⁴

Due to shared modes of transmission, many individuals have been exposed to HBV, HCV, HIV, and syphilis infection in various combinations. A study on pregnant women attending antenatal showed that prevalence of HBV, HCV, HIV, and syphilis was 3.4%, 2.6%, 12.4%, and 0.08%, respectively while the co-infection prevalent rate was HIV-HBV (0.24%), HIV-HCV (0.14%), and HBV-HCV (0.0%).³⁵ These co-infections have been associated with drug-related hepatotoxicity, reduced survival, drug resistance and cross-resistance, and sub-optimal response.³⁶ Moreover, syphilis and other STIs might be indicators of ongoing behaviors and

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Received: 29 October 2020; revised: 6 January 2021; accepted: 12 January 2020

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Figure 1. Ebonyi state map showing the location of the health facilities that participated in the study.

Source. Ananda Marga Universal Relief Team Nigeria, January 2021.

exposure that place an individual at a higher risk for acquiring HIV.^{10,31}

Although studies have been carried out on HBV, HCV, HIV, and Syphilis prevalence among pregnant women in Ebonyi state, none has studied co-infection rate and in the rural health facilities. Therefore, the objective of this study is to assess the prevalence, co-infection, and risk factors associated with HBV, HCV, HIV and Syphilis infections among pregnant women receiving antenatal care in AMURT supported rural health facilities in Ebonyi state.

Methods

Study Design and Setting

This was a retrospective study, conducted from January to December 2018 in 8 AMURT (Ananda Marga Universal Relief Team)-supported rural primary health care facilities in 5 (5) local government out of 13 (13) in Ebonyi state south-east Nigeria (Figure 1).

Sample and Sampling Technique

All the 4657 pregnant women attended the antenatal clinic within the study period were included in this retrospective study.

Study Instrument and Data Collection

All the antenatal records with available sociodemographic variables (mother's age, gestational age, parity, and level

of education), HIV, HBV, HCV, and syphilis screening results were used for the study. Also, risk factors such as History of Blood Transfusion and Ever has surgery as recorded were also used. However, there was no record of HBV vaccination.

Laboratory Method

Test for hepatitis B surface antigen and antibodies to HCV were determined with the Clinotech diagnostic enzyme-linked immunosorbent assay (ELISA) test kits (Clinotech Laboratories) which has sensitivity and specificity of 100% and 98.7% for hepatitis B surface antigen (HBsAg) and HCV test kits. Syphilis was checked with Venereal Disease Research Laboratory (Clinotech Biotech Inc.) with 100% and 99.3% sensitivity and specificity respectively). Antibodies to antibodies to HIV type 1 and 2 antibodies were carried out with the use of Chembio HIV-1/2 Stat Pak (Combo Diagnostic Systems) and Unigold Determine HIV-1/2 test kit (Abbot Laboratories) with >99.9% and 98.5% specificity. All reactive samples were confirmed using ELISA and the results were reported as positive or negative. The serological tests performed in all health facilities were the same.

Statistical Analyses

The data collected were analyzed using descriptive and inferential statistics with the aid of IBM SPSS statistics version 20. Descriptive statistics were presented as frequency tables and percentages. Inferential statistical technique such as chi-square and kappa statistics (k) was used to test the hypotheses at $P \leq .05$.

Ethics Approval and Consent to Participate

We obtained ethical approval from Ebonyi State Ministry of Health. Informed and written consent was obtained from the Ananda Marga Universal Relief Team who released their ANC record for the study.

Results

A total of 4657 pregnant women that attended antenatal care (ANC) at the 8 selected AMURT supported rural health facilities were used in the study. The socio-demographic characteristics revealed that majority of them were 26 to 30 years (34.4%), in their second trimester (52.7%), multiparous (43.3%), and had primary education (53.2%).

Overall, 189 out of 4657 tested positive for both HBV and HCV with a prevalence rate of 4.1% respectively. Forty-one (41) out of 4657 tested positive for HIV with a prevalence rate of 0.9% while 84 out of 4657 tested positive for syphilis (VDRL test) with a prevalence rate of 1.8%.

Prevalence of HBV was more among on <20 years (4.7%), in the third trimester (4.6%), multiparous and grand

Table 1. Socio-Demographic Characteristics and Prevalence of HBV, HCV, HIV, and Syphilis among Women Attending ANC in AMURT Supported PHCs in Ebonyi State, Nigeria from January to December 2020 (N=4657).

Variable	No tested (%)	HBV +ve f (%)	HCV +ve f (%)	HIV +ve f (%)	Syphilis +ve f (%)
Age (years)					
≤20	642 (13.8)	30 (4.7)	29 (4.5)	3 (0.5)	18(2.8)
21-25	1410 (30.3)	52 (3.7)	62 (4.4)	16 (1.1)	29 (2.1)
26-30	1600 (34.4)	71 (4.4)	60 (3.8)	14 (0.9)	26 (1.6)
31-35	671 (14.4)	21 (3.1)	28 (4.2)	5 (0.7)	9 (1.3)
36-40	309 (6.6)	14 (4.5)	10 (3.2)	2 (0.6)	2 (0.6)
>40	25 (0.5)	1 (4.0)	0 (0.0)	1 (4.0)	0 (0.0)
Gestational age					
First trimester	647 (13.9)	18 (2.8)	33 (5.1)	9 (1.4)	13 (2.0)
Second trimester	2452 (52.7)	99 (4.0)	103 (4.2)	20 (0.8)	42 (1.7)
Third trimester	1558 (33.5)	72 (4.6)	53 (3.4)	12 (0.8)	29 (1.9)
Parity					
Primipara	1532 (32.9)	61 (4.0)	60 (3.9)	12 (0.8)	37 (2.4)
Multipara	2016 (43.3)	82 (4.1)	80 (4.0)	17 (0.8)	30 (1.5)
Grand multipara	1109 (23.8)	46 (4.1)	49 (4.4)	12 (1.1)	17 (1.5)
Primary healthcare centers					
Ephuenyim	1382 (29.7)	14 (1.0)	18 (1.3)	3 (0.2)	0 (0.0)
Akparata	340 (7.3)	19 (5.6)	10 (2.9)	5 (1.5)	8 (2.4)
Odeligbo	975 (20.9)	40 (4.1)	48 (4.9)	8(0.8)	9 (0.9)
Uloanwu	225 (4.8)	10 (4.4)	7 (3.1)	0 (0.0)	4 (1.8)
Elugwu Ettam	295 (6.3)	16 (5.4)	14 (4.7)	3 (1.0)	7 (2.4)
Gmelina	563 (12.1)	0 (0.0)	8 (1.4)	5 (0.9)	14 (2.5)
Mgbalagwu	450 (9.7)	28(6.2)	15 (3.3)	12(2.7)	16 (3.6)
Offia Oji	427 (9.2)	62(14.5)	69 (16.2)	5 (1.2)	26 (6.1)
Level of education					
No formal	519 (11.1)	6 (1.2)	16 (3.1)	5 (1.0)	6 (1.2)
Primary	2479 (53.2)	105 (4.2)	96 (3.9)	17(0.7)	41 (1.7)
Secondary	1515 (32.5)	73 (4.8)	67 (4.4)	17(1.1)	36 (2.4)
Tertiary	144 (3.1)	5 (3.5)	10 (6.9)	2 (1.4)	1 (0.7)
Overall prevalence	4, 657 (100)	189 (4.1)	189 (4.1)	41 (0.9)	84 (1.8)

Note. +ve=Positive; f=Frequency; %=percentage.

multiparous (4.1%) respectively, and had secondary education (4.8%).

In addition, HCV prevalence was more among women age <20 years old (4.5%), in the first trimester gestational age (5.1%), grand multiparous (4.4%), and had tertiary education (6.9%).

The prevalence of HIV was more among women >40 years (4.0%), in first trimester (1.4%), grand multiparous (1.1%), and had tertiary education (1.4%).

Also syphilis prevalence was more amongst women <20 years of age 2.8%, in first trimester (2.0%), primiparous (2.4%), and had secondary education (2.4%) (Table 1).

The co-infection prevalent rate of HIV-HBV, HIV-HCV, and HIV-Syphilis were 0.1% ($\kappa=0.012$; $P=.288$), 0.1% ($\kappa=0.003$; $P=.789$) and 0.1% ($\kappa=0.020$; $P=.137$) respectively. Also, the HBV-HCV and HBV- Syphilis co-infection prevalence rate were 0.3% ($\kappa=0.024$; $P=.103$) and 0.1% ($\kappa=0.012$; $P=.375$) respectively while the HCV- Syphilis co-infection prevalence rate was 0.1% ($\kappa=0.012$; $P=.375$) (Table 2).

Risk factors as recorded in the ANC records were history of blood transfusion and surgery. Out of 4657 pregnant women tested, 1.1% had history of blood transfusion while 1.0% had history of surgery. Amongst those who had history of blood transfusion, 11.8% ($\chi^2=7.865$; $P=.005^*$), 11.8% ($\chi^2=7.865$; $P=.005^*$), 2.0% ($\chi^2=0.090$; $P=.406$) and 2.0% ($\chi^2=0.007$; $P=.932$) tested positive for HBV, HCV, HIV, and Syphilis respectively.

Furthermore, among those who had history of surgery, 8.9% ($\chi^2=2.723$; $P=.099$), 8.9% ($\chi^2=2.723$; $P=.099$), 2.2% ($\chi^2=0.938$; $P=.333$), and 0.0% ($\chi^2=0.835$; $P=.361$), tested positive for HBV, HCV, HIV, and Syphilis respectively (Table 3).

Discussion

HBV, HCV, HIV, and Syphilis infection affecting pregnant mothers may result in maternal and fetal morbidity and mortality. It could also result in chronic infection in the newborn. Prevalence and co-infection rates of HBV, HCV, HIV, and

Table 2. Co-Infection Rate of HBV, HCV, HIV, and Syphilis among Pregnant Women.

Infection	HIV		Kappa statistic (κ)	Df	P-value
	Negative (%)	Positive (%)			
HBV					
Negative	4330 (95.1)	38 (0.8)	0.012	1	.288
Positive	186 (4.0)	3 (0.1)			
HCV					
Negative	4429 (95.1)	39 (0.8)	0.003	1	.789
Positive	187(4.0)	2 (0.1)			
Syphilis					
Negative	4534 (97.4)	39 (0.8)	0.020	1	.137
Positive	82 (1.8)	2 (0.1)			

Infection	HBV		Kappa statistic (κ)	Df	P-value
	Negative	Positive			
HCV					
Negative	4291 (92.1)	177 (3.8)	0.024	1	.103
Positive	177 (3.8)	12 (0.3)			
Syphilis					
Negative	4389 (94.2)	184 (4.0)	0.012	1	.375
Positive	79 (1.7)	5 (0.1)			

Infection	HCV		Kappa statistic (κ)	Df	P-value
	Negative	Positive			
Syphilis					
Negative	4389 (94.2)	184 (4.0)	0.012	1	.375
Positive	79 (1.7)	5 (0.1)			

Note. Df= degree of freedom.

Table 3. Analysis of Risk Factors Vis-a-Vis Prevalence of HBV, HCV, HIV, and Syphilis to Establish Statistical Association between the Variables.

Infection	Risk factors		χ^2	P-value
	Ever transfused blood			
	Yes (%)	No (%)		
No tested = 4, 657 (100%)	51 (1.1)	4606 (98.9)		
HBV +ve	6 (11.8)	183 (4.0)	7.865	.005*
HCV +ve	6 (11.8)	183 (4.0)	7.865	.005*
HIV +ve	1 (2.0)	40 (0.9)	0.090	.406
Syphilis +ve	1 (2.0)	83 (1.8)	0.007	.932

Infection	Ever had surgery		χ^2	P-value
	Yes	No		
	No tested = 4, 657(100%)	45 (1.0)		
HBV +ve	4 (8.9)	185 (4.0)	2.723	.099
HCV +ve	4 (8.9)	185 (4.0)	2.723	.099
HIV +ve	4 (2.2)	40 (0.9)	0.938	.333
Syphilis +ve	0 (0.0)	84 (1.8)	0.835	.361

Note. +ve= positive, χ^2 =chi-square.

*P < .05 (two tailed).

Syphilis infection varies in different parts of the world. Even in the same country, there are regional and populace precise variations.

In this study, the overall prevalence of HBV, among women attending ANC in AMURT supported PHCs in Ebonyi State, was 4.1% and is being classified as an area of medium endemicity.¹² This medium prevalence was higher to the findings at different regions in Nigeria as recorded by other authors such as; 3.4% in Enugu,³⁵ 2.2% in Benin Edo state³⁷ 1.0% in Anyigba community Kogi state,³⁸ and outside Nigeria, such as 0.4% in rural Bangladesh,³⁹ 1.6% in Egypt,⁴⁰ 1.02% in China⁴¹ 2.0% in Guam USA,⁴² 2.5% in Haiti (North America),⁴³ 3.07% among India women.⁴⁴ The HBV prevalence recorded in this study was lower than the findings conducted in Nigeria which were: 5% in Niger Delta,⁴⁵ 5.33% in Abakaliki,⁸ 5.6% in Edo state,⁴⁶ 6.7% in Bauchi,⁴⁷ 7% in Jos,⁴⁸ 8.2% in Yola,⁴⁹ 8.5% in Kaduna,⁵⁰ 7.3% in Kano,⁵¹ 19.8% in Keffi Nassarawa state⁵² while outside Nigeria, in countries like Uganda, Southern Ethiopia, and southwest Ethiopia a prevalence of 11.8%, 4.5%, and 6.9% respectively were recorded.⁵³⁻⁵⁵ In comparison to the prevalence of HBV as explored in other studies, findings showed that Nigeria is an area of high endemicity, and with regard to higher hepatitis B prevalence, this infection is easily transmitted in common activities particularly in poor hygienic areas such as those found in Northern region of the where higher prevalence rates were recorded and other African regions like Ethiopia and Uganda.

Additionally, the HCV prevalence among the women in this study was 4.1%. In Federal Ministry of Health (FMOH) and World Health Organization report, Nigeria has a high burden of hepatitis C at a prevalence rate of 2.0%,¹⁷ hence women that received antenatal health care in the AMURT supported rural health facilities in Ebonyi state have a high HCV prevalence rate. This is higher than the findings of other studies in Nigeria which were: 2.6% in Enugu,³⁵ 0.8% in Edo State,³⁷ 0.5% in Niger delta,⁴⁵ 1.1% in Okada, Edo state,⁴⁶ 0.8% among Cameroonian women,⁵⁶ and 1.8% in Southern Ethiopia.⁵⁴ The result is lower than the findings outside Nigeria in places like Western Ethiopia where HCV prevalence of 8.1%.⁵⁷ The higher prevalence of syphilis found in this study in comparison to other countries like Cameroon and Southern Ethiopia may be caused by factors of blood transfusion which was found significant with HCV in the study.

Furthermore, the prevalence of HIV in this study was 0.9%. This is lower than the current 1.5% prevalence reported in Nigeria²⁸ and in the studies in other regions of the country like 2.67% in Abakaliki,⁸ 12.4% among antenatal women in Enugu³⁵ 4.1% in Niger Delta,⁴⁵ 7.8% reported in Minna,⁵⁸ and 7.2% in Edo State.³⁷ While the prevalence of 2.7%, 10.2%, and 9.6% was recorded outside Nigeria at Southern Ethiopia, Cameroon, and North West Ethiopia respectively.^{54,59,60} It is clear that there was a low HIV prevalence among the study

population and this could be as a result of increased awareness and campaign against HIV prevention, and free management of the infection that is being offered in the state.

Also, from this study, the prevalence of syphilis among antenatal attendees in Ebonyi was 1.8%. This is higher than the 0.8% prevalence in Nigeria among antenatal women, according to the World Bank collection of development indicators.³⁴ Other reports in Nigeria revealed a prevalence of 0.08% among pregnant women at Enugu,³⁵ 0.33% in Abakaliki,⁸ 1.7% in Cameroon,⁵⁹ and 1% in Gondar, Ethiopia, among antenatal women.⁶¹ A higher prevalence of 5.0% was reported in Niger state by Buseri, Seiyaboh, and Jeremiah.⁴⁵ In comparison to these findings, Ebonyi State is a syphilis endemic region. Because, after the initial infection, the *Treponema pallidum* (syphilis bacteria) can remain dormant in one's body for a long time before becoming active again, mothers may not experience its signs and symptoms then thinking that they are healthy. Thus early detection and prompt treatment is important because it can be passed from mothers to unborn children.

There were 3 (0.1%) cases of HBV and HIV co-infection, 2 (0.1%) cases of HCV and HIV co-infection, and 2(0.1%) case of HIV and Syphilis co-infection. This finding is lower than the HBV and HIV co-infection prevalent rate of 0.24%, 2.1% reported by other authors in Enugu and Yirgalem respectively^{35,62} while a higher HCV/HIV co-infection prevalence rate of 0.5% and 0.23% was reported by Ejeta and Dabsu in Ethiopia⁵⁷ and Omatola et al³⁸ in Anyigba community respectively. Additionally, there were cases 12 (0.3%) of HBV and HCV coinfection, 5 (0.1%) HBV-Syphilis coinfection and 5 (0.1%) HCV-Syphilis coinfection. These coinfections were overall 0.623% of all the study participants, though the co-infection rates recorded in this study were not statistically significant $P > .05$ but the highest co-infected infections were HBV and HCV. This could be because Nigeria being ranked first amongst the countries of the world endemic for Schistosomiasis,⁶³ which is a leading cause of HBV and HCV coinfection in endemic areas and pregnant women are vulnerable to it.⁶⁴

On the risk factors, history of blood transfusion was significantly associated with HBV and HCV prevalence ($P = .005^*$) but not significant with HIV ($P = .090$) and Syphilis ($P = .932$) while ever had surgery was not significant with HBV ($P = .099$), HCV ($P = .099$), HIV ($P = .938$), and Syphilis ($P = .361$) prevalence. In the same vein, EL-Shabrawi et al,⁴⁰ Oladeinde et al,⁴⁶ and Zenebe et al⁶⁵ reported that previous history of blood transfusion and history of surgery were significantly associated with HBV infection like other studies conducted in Southern Ethiopia,⁵⁴ in Arba Minch, South Ethiopia⁶⁶ Addis Ababa, Ethiopia,⁶⁷ and Dessie, Ethiopia.⁶⁸ However, the history of blood transfusion significantly increases the risk of HIV infection in the report of Ejeta and Dabsu⁵⁷ which contrasted with the findings of this present study.

The study was limited by the following: it was an already existing data for 1 year (January-December 2018) and some other risk factors could not be accessed. A more comprehensive result would have been obtained if the data was analyzed for several years, and records for previous HBV vaccination was not captured.

Conclusion

Hepatitis B and C virus, Human immunodeficiency virus, and syphilis infection are global health problems that call for high precedence in their prevention and management. The medium prevalence of HBV (4.1%) observed in this study which is much lower than the national prevalence of 11.2% reported by the Federal Ministry of Health (FMOH) and World Health Organization (WHO) should not encourage complacency because of the harmful effect of untreated maternal infection on pregnancy outcome and spread of HBV. The high burden of HCV (4.1%) in the study population is much higher than the national prevalence of 2.0% and this call for serious attention to reduce the risk of MTCT of HCV infection which will adversely affect the newborn. The low prevalence of HIV, 0.9% in this study which is higher than the national prevalence of 1.5% could be due to the increased level of awareness among antenatal women in Ebonyi and environs on the prevention of Mother to Child Transmission (PMTCT) of HIV/acquired immunodeficiency syndrome (AIDS) as well as the Health Education given to them during an antenatal visit in the health centers. The prevalence of syphilis (VDRL test) among antenatal attendees in Ebonyi is 1.8% and is higher than the 0.8% national among antenatal women. Thus, raising awareness through health education, partnerships promotion, and resource mobilization, scale-up of screening, early care and appropriate free treatment services should be provided for pregnant women attending Antenatal Care by Stakeholders to reduce the risk of spread of infections to neonates through mother to child transmission.

Acknowledgments

We acknowledge the AMURT health workers who helped pick the data of pregnant women that attended ANC in their facilities from January to December 2018.

Authors' Contribution

MU, PS, TB, CE, DE, and OA conceptualized, designed, and coordinated the study. MU, PCIU, CAN, and RNO critically revised the manuscript. MU, IEN, NE, AU, NAA, OJC, and CAN supported in collection, interpretation, and data analysis. All authors read and approved the final manuscript.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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