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SEROPREVALENCE OF HIV, HBV AND MALARIA IN PREGNANT WOMEN IN SOUTH-SOUTH, EDO STATE, NIGERIA

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ABSTRACT:

Background: Malaria, HIV and HBV continue to contribute to the burden of public health issues in pregnant women, they are contributory factor to significant fetal loss and anaemia and intra uterine fetal death in children born to mothers with these co-infections.

Objectives: to determine the prevalence of HIV, HBV and malaria in pregnant women.

Methods: This was a descriptive cross-sectional study carried out among 400 pregnant women attending antenatal clinic at a private clinic. Respondents were selected using an interviewer administered questionnaire

Results shows that out of the 400 pregnant women, 3 (0.8%) of the respondents were HBsAg positive and 5 (1.4%) were HIV positive. The respondents' Iron supplementation adherence, dietary diversity, HIV status, HBV status and prevalence of malaria did not significantly influence the prevalence of anemia in pregnancy. The prevalence of malaria was 20 (5.2%) among the respondents.

Conclusion: There was a high prevalence of Malaria with low prevalence of HBV and HIV among the studied population. In view of the public health importance of these infections, early treatment and introduction of vaccines against these infections particularly HBV is advocated.

INTRODUCTION

Worldwide, it has been shown that infectious diseases continue to remain life-threatening, and a major public health problem and pregnant women are mostly at risk of these infectious diseases. Co-infections with Human immunodeficiency virus, Hepatitis B virus, Malaria and poor nutrition have shown to be significant risk factors for poor pregnancy outcomes in the area of low birth weight, anaemia, early fetal loss, stillbirth and prematurity [1, 2].

Nigeria has 1.9 million people living with HIV. Out of which 1million were women of reproductive age (15-49 years) [2, 3]. The magnitude of HIV among pregnant women attending antenatal clinic (ANC) in Nigeria varies from 0.2% [4] to 12.1% [5]. Moreover, nationwide HIV sentinel survey reported 3.0% in 2009 [6] and 2.2% in 2014 [7]. HIV and other sexually transmitted infections (STIs) such as HBV infection are commonly encountered in these groups of patients and are a cause of morbidity and mortality particularly in resource limited countries such as Nigeria [8]. Therefore, to reduce the rapidly growing burden of HIV and HIV-HBV co-infections in Nigeria, it is very important to protect young women and decrease the rate of vertical transmission and protect the new generations [9].

In pregnancy, HBV infection is a serious and common infectious disease of the liver, majorly transmitted through sexual contact and blood transfusion and a significant risk factor for maternal complications including: pre-eclampsia, placenta previa, preterm delivery, placental separation, ante-partum haemorrhage, preterm labour, increased incidence of intraventricular haemorrhage, gestational diabetes mellitus and mortality with a high rate of vertical transmission leading to fetal and neonatal hepatitis [10]. Transmission from mother to infant takes place inutero, during delivery, and after birth through breast feeding. Children born to seropositive mothers have 70–90% chance of prenatal acquisition of HBV infection and over 85–90% of them will eventually become chronic carriers of the disease. The complications of chronic carriers of HBV are increased risk of developing liver cell carcinoma and cirrhosis [1,11, 12]

studies have shown high HBV infection prevalence greater 4.2% in Nigeria, data on its prevalence among pregnant women are scanty. Seroprevalence for malaria (11.6%), HBV (4.2%), HIV (1.0%) have been reported in Nigeria

In Nigeria, 11% of maternal deaths are attributed to malaria [13]. To further buttress the worrisome malaria picture, several studies have reported high prevalence rates of malaria in pregnancy in different parts of Nigeria, ranging from 19.7% to 72.0% [14,15,16]

Food diversity in pregnancy is consumption of different kinds of food across all diets which enables the optimum intake of essential nutrients that can promote health, physical and mental development. It is an index used to measure dietary adequacy of pregnant women.[17,18,19,] It has been reported that around 870 million people are estimated to be underweight across the world. Out of these, 852 million lived in developing countries. It is evident that more than 3.5 million women and children age under five in developing countries die each year due to malnutrition[20,21,22]. Good nutrition during pregnancy has been demonstrated to be a fundamental determinant for growth and development of infants and better nutritional status of mothers. [23] Causes of poor nutrition in pregnancy in Nigeria includes illiteracy, socio-cultural taboos, household work patterns and physiological alteration in pregnancy[21,23] Studies have shown pregnant women who suffer poor nutritional are at risk of an adverse birth outcome such as intrauterine growth, obstructed labor, having a baby with a low birth weight, or death due to postpartum hemorrhage[20.24]. The conceptual framework of malnutrition formulated by the United Nations Children's Fund (UNICEF) stipulates that the immediate causes of maternal malnutrition are inadequate dietary intake and diseases[21,23,24]. The diet which is consumed by pregnant women reflects not only their own intake, but also the diets of their families. Consequently, a pregnant woman with higher food diversity ensures the adequacy of dietary diversity for their children and families.

The impact of these infectious diseases and poor nutritional diversity reviewed above could significantly influence the health and optimum well-being of pregnant women and their fetuses either occurring as mono- or coinfections. The seroprevalence of HIV, HBV, Malaria and food diversity among pregnant women in Benin city is currently lacking. This put together informed our decision to investigate the seroprevalence of these three infectious diseases and food diversity among pregnant women attending antenatal clinics at a private hospital Benin City.

MATERIALS AND METHODS

The study was a descriptive cross-sectional study carried in Edo State, among 400 pregnant women attending antenatal clinic at a private facility in the state. The sample size was calculated using the formula for single proportions, using a prevalence of 46.2%,[22] which is the proportion of prevalence of anaemia in pregnant women in Benin city from a previous study. Systematic sampling technique was utilized to recruit respondents for this study after calculating the sampling interval to (determine the nth number), then every nth respondent was selected from the sampling frame (clinic attendance) until sample size was achieved.

Data collection

Each participant was administered a pretested structured questionnaire. The questionnaire addressed socio-demographic parameters and relevant obstetric history to the study. Venous blood specimen (5mls) was collected into a sterile ethylene-diamine-tetra-acetate (EDTA) anticoagulated bottle, after which it was analyzed for Packed cell volume using micro-hematocrit method, Hemoglobin concentration using haemoglobinometer and Plasma Malaria parasitemia using rapid screening kit. The retrieved data checked for completeness analyzed using SPSS version 26.0 statistical package. Mean and standard deviation (SD) were used to describe continuous variables and proportions for categorical data. Skewed continuous variable were presented as median with range. Two-tail student's t−test was used for comparison of two means, X^2 (chi−squared test) for group comparisons to determine the significance of observed differences or association where applicable. The level of significance was set at 0.05.

Dietary diversity scoring

Food Categories	Description
Foods made from grains	Bread, rice, maize, or other food from grains
White roots and tubers and plantains	Potatoes, yams, cassava, cocoyam, or any other foods made from white-fleshed roots or tubers, or plantains
Pulses (beans, peas and lentils)	Soya beans, beans, Cowpea, or peas (fresh or dried seed)
Nuts and seeds	Groundnut/peanut, tiger nuts, palm nut
Milk and milk products	Milk, cheese, yoghurt or other milk products but NOT including butter, ice cream
Organ meat	Liver, kidney, heart or other organ meats or blood-based foods
Meat and poultry	Beef, pork, lamb, goat, rabbit, wild game meat, chicken
Fish and seafood	Fresh/dried/fried fish, shellfish or seafood, snail, crab, shrimp, lobster, smoked fish, herrings, salmon
Eggs	Eggs from poultry or any other bird
Dark green leafy vegetables	Spinach, moringa, Ewedu, Green, Scent leave, Soko leave,
Vitamin A-rich vegetables, roots and tubers	Apricot, Pumpkin, carrots, squash or sweet potatoes, lettuce
Vitamin A-rich fruits	Ripe mango, ripe papaya, watermelon
Other vegetables	Tomatoes, okro, garden eggs, cabbage
Other fruits	Orange, pineapple, lemon

Dietary diversity scores were calculated by summing the number of food groups consumed in the household or by the individual respondent over the 24-hour recall period. The following steps were included in creating Dietary Diversity Score: New food group variables were created for those food groups that need to be aggregated such as Vitamin A rich fruits and vegetables aggregated to

Vitamin A sources; Other fruits and vegetables were aggregated together. A total score of 12 was thus obtained and the indicator's value (11.2), which is the mean DDS, served as the cutoff point.[23]

Under-reporting by the respondents was a major limitation in the study, this was minimized by assurance of confidentiality and arrangement of the questions were patterned starting from less embarrassing to more sensitive questions.

Ethical clearance was sought and obtained from the ethics and research committee of the central hospital Benin city.

RESULTS:

Section A: Sociodemographic characteristics

Table 1: Sociodemographic characteristics of the respondents

Variable	Frequency (n = 400)	Percent
Age (years)		
≤ 26	53	13.3
27 – 30	165	41.2
31 – 35	114	28.5
≥ 36	68	17.0
Marital status		
Single	17	4.2
Married	383	95.8
Ethnicity		
Benin	196	49.0
Esan	59	14.8
Igbo	38	9.5
Etsako	29	7.2
Urhobo	16	4.0
Others*	62	15.5
Religion		
Christianity	394	98.5
Islam	6	1.5
Occupation		
Business/self employed	190	47.5
Teacher	51	12.8
Tailor	39	9.8
Hairdresser	34	8.5
Unemployed	29	7.2
Civil servant	27	6.8
Student	20	5.0
Others**	10	2.5
Level of education		
No formal	4	1.0
Primary	31	7.8
Secondary	238	59.4
Tertiary	127	31.8
Monthly income in Naira (n = 283)		
< 18,000	103	36.4
18,000 – 50,000	161	56.8
> 50,000 – 100,000	18	6.4
> 100,000	1	0.4
Socioeconomic class		
Low (class 4 and 5)	42	10.5
Medium (Class 3)	215	53.7
High (Class 1 and 2)	143	35.8

Mean age = 30.3±4.4 years; Others include Delta Ibo, Itsekiri, Isoko, Calabar, Akoko Edo, Tiv, Ibibio, Idoma, Igala, Cameroon; Others** included clergy, nurses, cleaners, midwives and bankers*

One hundred and sixty-five (41.2%) of the women were 27 – 30 years while 114 (28.5%) were 31 – 35 years old. Three hundred and eighty-three (95.8%) were married and 196 (49.0%) were Benin. Most, 394 (98.5%) were Christians and almost half, 190 (47.5%) were self-employed and business owners. Two hundred and thirty-eight (59.4%) had secondary education while 127 (31.8%) had tertiary level of education. One hundred and sixty-one (56.8%) had monthly income of 18,000 – 50,000 naira while 103 (36.4%) received less than 18,000 naira per month. More than half, 215 (53.7%) were in medium socioeconomic class while 143 (35.8%) were high class.

Table 2: Obstetric history of the respondents

Variable	Frequency (n = 400)	Percent
First Antenatal visit		
Yes	37	9.3
No	363	90.7
Gravidity		
1	90	22.5
2 – 4	228	57.0
≥ 5	82	20.5
Parity		
0	150	37.5
1	97	24.2
2 – 4	150	37.5
≥ 5	3	0.8
Previous termination of pregnancies		
Yes	141	35.2
No	259	64.8
Previous Miscarriage		
Yes	80	20.0
No	320	80.0
Previous IUFD		
Yes	7	1.8
No	393	98.2
Number of children alive		
0	153	38.2
1	99	24.8
2 – 4	146	36.5
≥ 5	2	0.5
Last childbirth (n = 249)		
< 2 years	18	7.2
2 – 3 years	112	44.8
4 – 5 years	79	31.6
≥ 6 years	41	16.4
Method of last delivery (n = 250)		
Spontaneous vaginal delivery	205	82.0
Assisted vaginal delivery	16	6.4
Caesarean section	29	11.6
Location of last delivery (n = 250)		
Hospital	220	88.0
Home	14	5.6
Church	8	3.2
Primary healthcare centre	7	2.8
Traditional birth home	1	0.4

Mean gravidity = 3.1±1.8; Mean parity = 1.2±1.2; Mean number of children alive = 1.2±1.2; Mean duration from last child birth (LCB) = 4.2±2.9 years;

Thirty-seven (9.3%) of the respondents who participated in the survey at their first antenatal visit. More than half, 228 (57.0%) were multigravida and 150 (37.5%) were multiparous. One hundred and fifty (37.5%) had not previously carried any pregnancy up to the age

of viability. One hundred and forty-one (35.2%) had previously terminated pregnancy, 80 (20.0%) had had a spontaneous miscarriage and 7 (1.8%) had previously had an intra uterine fetal death. One hundred and fifty-three (38.2%) had no child alive.

Of the proportion of those with previous delivery (n = 250), 112 (44.8%) had their last delivery 2 – 3 years before the survey while 18 (7.2%) delivered less than 2 years before the index pregnancy. Most, 205 (82.0%) delivered by spontaneous vaginal delivery while 29 (11.6%) had caesarean section. Also, 220 (88.0%) delivered in hospital previously.

Table 3: Obstetric history of the respondents continued

Variable	Frequency (n = 400)	Percent
Gestational age (Weeks)		
14 – 27	62	15.5
28 – 32	158	39.5
33 – 36	125	31.3
37 – 40	55	13.8
Multiplicity of pregnancy		
Unknown	3	0.7
Singleton	386	96.5
Twins	11	2.8

Mean gestational age = 31.3±5.4 weeks

One hundred and fifty-eight (39.5%) of the respondents were 28 – 32 weeks into their pregnancies while 55 (13.8%) were term pregnancies. Three hundred and eighty-six (96.5%) were singleton pregnancies while 11 (2.8%) had twins.

Section C: Level of malaria parasitaemia

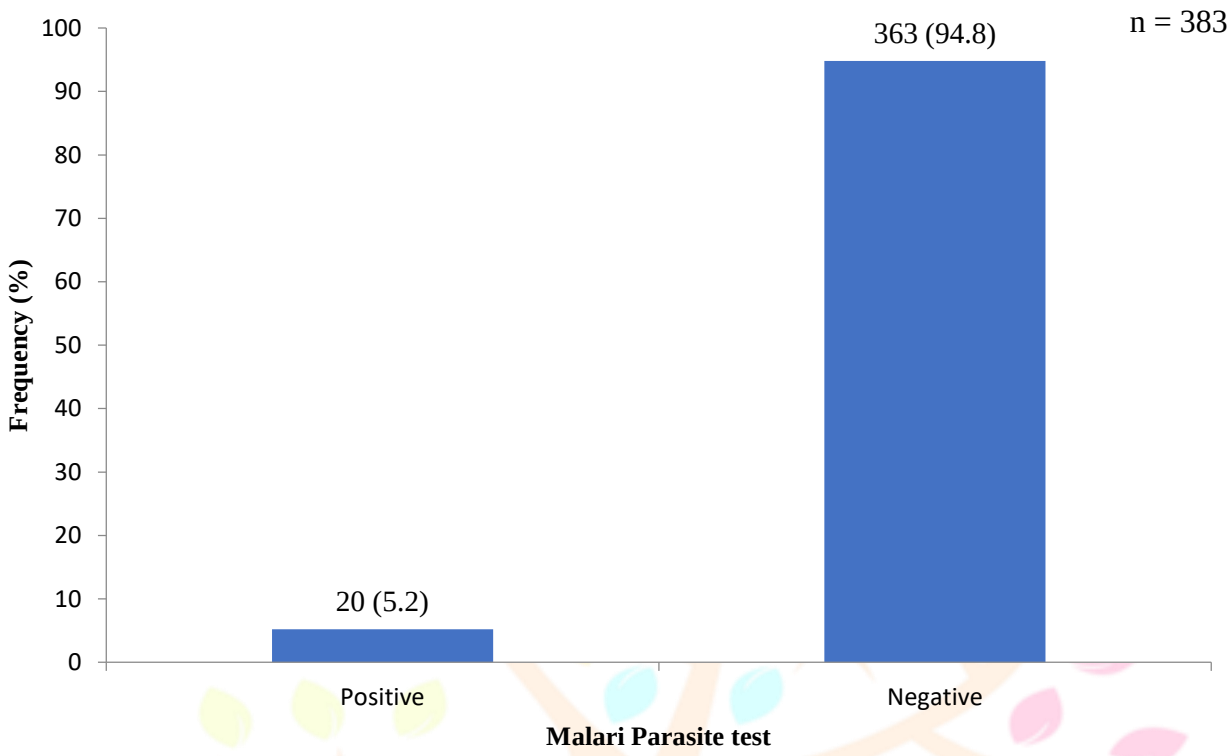

Figure 2: Malaria prevalence among the respondents

The prevalence of malaria was 20 (5.2%) among the respondents.

Section E: Seroprevalence of HIV, HBsAg, Anti-HCV in pregnant women

Table 4: HBsAg and HIV status of respondents

Variable	Frequency	Percent
HBsAg status (n = 378)		
Positive	3	0.8
Negative	375	99.2
HIV status (n = 363)		
Positive	5	1.4
Negative	358	98.6

There were no HCV positive results

HBsAg = Hepatitis B surface antigen; HIV = Human immunodeficiency virus

Three (0.8%) of the respondents were HBsAg positive and 5 (1.4%) were HIV positive.

Table 5: Association between dietary diversity, HIV, HBV and malaria prevalence

Variable	Packed Cell Volume		Test statistic	p value
	Normal	Anaemic		
	n = 219 (%)	n = 133 (%)		
Iron supplementation adherence				
Low	128 (63.7)	73 (36.3)	χ^2= 2.329	0.312
Moderate	64 (68.1)	30 (31.9)		
High	17 (53.1)	15 (46.9)		
Dietary diversity				
Low	75 (62.0)	46 (38.0)	χ^2= 0.004	0.948
High	144 (62.3)	87 (37.7)		
HIV status				
Positive	2 (40.0)	3 (60.0)	FE = 1.364	0.350
Negative	213 (65.1)	114 (34.9)		
HBsAg status				
Positive	1 (33.3)	2 (66.7)	FE = 1.073	0.559
Negative	213 (62.5)	128 (37.5)		
Prevalence of Malaria				
Positive	11 (73.3)	4 (26.7)	χ^2= 0.746	0.388
Negative	205 (62.3)	124 (37.7)		

The respondents' Iron supplementation adherence, dietary diversity, HIV status, HBV status and prevalence of malaria did not significantly influence the prevalence of anaemia in pregnancy.

DISCUSSION

The mean age of the 400 pregnant women studied was 36.3+4.4 (range 26-36) years. Of the 383 subjects tested for malaria 20(5.2%) were positive. Three hundred and eighty-seven tested for HBV 3(0.8%) were positive and 368 tested for HIV 5(1.4%) were positive.
In this study, 5% of the pregnant women were HIV positive indicating that HIV is still a major public health challenge among women of reproductive age in Benin City of Edo state. The 5% seroprevalence observed is similar to 4.9% described among pregnant women age 15-49years in Osogbo, Osun state in a recent Nigeria survey, Oluyinka et al 2016[25] This may have occurred due to poor adherent to HIV preventive measures currently because all attention is on covid 19 pandemic.

HIV infection among pregnant women in this study was however lower than 7.2%, 10%, 10.6% and 12.9% as reported in 2013[26] and 2014[27] for pregnant women in Benin City and Benue state respectively. However, these studies were conducted in the rural communities where bulk of the traditional practices and behaviors that promote the spread of HIV take place. This was demonstrated in a study done by Labadarios et al[28] .

There was obvious interplay in interactions between HIV, HBV, Malaria and dietary diversity among the pregnant women in this study. The seroprevalence of HBV in this study was 0.8% which is comparable to previous studies[29]. Although higher prevalence of 4.2% has been reported in another study by Rabiu et al[30]. This study was carried out in rural areas where native scarifications and tattooing are majorly practiced and other traditional practices that enhances the spread of HBV infection. Similar low prevalence value was reported in Benin city recently by Labadarios et al[28]. In these studies, there no significant association between blood transfusion and dietary

intake in the acquisition of HBV infection. Age, Marital status, parity, initiation of first antenatal visit and the educational status of pregnant women did not significantly affect the seroprevalence of HBV in this study.

The prevalence of malaria among the pregnant women in this study was 5.2% which is similar to previous studies by Rabiu et al[30]. The high prevalence of malaria cases observed in this study clearly explained that all the preventive and control measures against malaria both in pregnancy and in the general population have failed to yield the expected benefits. This was collaborated by previous studies[31]. Inappropriate used of insecticide treated nets, delayed booking, abuse of malaria chemoprophylaxis, poor hygiene and poor environmental sanitation may have accounted for these failed interventions.

In this study, HIV/ malaria, HBV/ malaria and HIV/HBV/malaria could coexist in the same pregnancy. HIV infection suppressed the body immune system which increases the chances of malaria infestations. This has been reported in the previous studies[32] High prevalence of malaria and HBV noted in this study may have accounted for the level of malaria/HBV co-infections. Other studies have shown that HBV DNA load is significantly higher in coinfected pregnant women[33]. The etiopathogenesis of Malaria and HIV infections are similar during the infective stage in the liver of their life cycles. The organisms invade the liver cells therefore causing hepatocellular damage making the pregnant women more vulnerable to other infections.

In this study, majority of the pregnant were nulliparous or of low parity and majority from low socio-economic class with nearly half of the pregnant women demonstrating poor adherence to iron supplementations and low dietary diversity which may expose the pregnant women to high prevalence of malaria and anaemia. These findings were collaborated by previous studies[34]

Low dietary diversity and poor adherence to iron supplementations were observed in this study. Nearly 50% of the pregnant women shown poor adherence and low dietary diversity which is similar to the findings in the previous study[34]. Several reasons may account for low dietary diversity; low level of education, cultural taboos, poverty and homework load which could lead to malnutrition, anaemia and infection with HIV, HBV and malaria. In this study, low dietary diversity was closely related to high prevalence of anaemia, HIV, HBV and malaria infections. This is similar to findings in the previous studies[31]. However, this relationship was not statistically significant.

LIMITATION OF THE STUDY

Under-reporting by the respondents was a major limitation in the study, this was minimized by assurance of confidentiality and arrangement of the questions were patterned starting from less embarrassing to more sensitive

CONCLUSION

The study has shown high prevalence of malaria and low prevalence of HBV and HIV infections among the studied population. Early detection and management of Malaria and HIV in pregnancy is mandatory. Despite the low prevalence HBV, the introduction of the vaccine is justifiable in view of the public health importance of the infection.

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