

Prevalence and Risk Factors in HBV/HIV Co-Infection among Pregnant Women Attending Antenatal Care in a Tertiary Institution in North Central Nigeria

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KEYWORDS

HBV/HIV Co-Infection, Pregnant Women, Antenatal Care, Prevalence, Risk Factors.

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Received: July 11, 2024; **Accepted:** August 19, 2024; **Published:** August 27, 2024

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Citation: Ezekwere S C, Ochima O, Dasofunjo J I, Afolabi, A, Akunaeziri U A, Yakubu M M. Prevalence and Risk Factors in HBV/HIV Co-Infection among Pregnant Women Attending Antenatal Care in a Tertiary Institution in North Central Nigeria. *Recent Trends Gynecol Obstet.* 2024;2(1):1-6.

Introduction

Global statistics showed that approximately 37 million persons are infected with HIV and 5-20% are co-infected with HB [1]. The seroprevalence of chronic HBV in HIV infected individuals vary significantly between regions and risk based groups, reflecting different patterns of transmission [1]. Sub-Saharan African is endemic for Hepatitis B and HIV infections and estimate has it that 70-95% of the adult population in this region have been exposed to HBV [2,3]. HBV and HIV co-infection in pregnant women is of public health significance because of potential for accelerated vertical transmission of both viruses [2]. The two viruses share same characteristics in terms of mode of transmission, use of reverse transcriptase enzyme, potential to progress to chronic infections, emergence of genomic mutation, and ease of formation of resistance to commonly available antiviral agents [4]. HBV/HIV co-infection significantly impacts the natural history, progression, and mortality related to both viruses with HIV infection accelerating HBV-related liver impairment [5].

Individuals co-infected with chronic HBV and HIV have worse

adverse outcome than mono-infected and have higher levels of HBV viraemia, increased likelihood of progression to cirrhosis and hepatocellular carcinoma [6]. Pregnant women with acute hepatitis have an increase incidence of premature labour, prematurity, neonates with low Apgar scores and an increased risk of intra-ventricular haemorrhage which is linked to preterm delivery [7]. It is also noted that in pregnant women with fulminant hepatic failure, there is increased incidence of intrapartum and postpartum haemorrhage, probably due to deranged hepatic function [7].

Administration of Hepatitis B immunoglobulin injection within 12 hours of birth (12-24 hours) in addition to other routine childhood immunization for all HBSAg exposed babies is highly recommended for prophylaxis and complete protection against development of subsequent Hepatitis later in life. Knowledge of the prevalence of HBV in HIV positive pregnant is also crucial in understanding the epidemiology of both viruses. An understanding of the risk factors associated with HBV/HIV co-infection would be beneficial in mapping out strategies in prevention programs aimed at curbing the menace and spread of

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This study aimed at determining the prevalence of HBV in HIV positive pregnant women attending antenatal care at Federal Medical Centre, Keffi and to ascertain the risk factors associated with HBV/HIV co-infection.

Materials and Methods

Study Area

The study was conducted at the Antenatal Clinic of the Department of Obstetrics and Gynaecology, Federal Medical Centre, Keffi. Keffi is in Nasarawa State North Central part of Nigeria. The health facility is a tertiary centre that provides specialist services and receives referral from other government and private hospitals in city and adjoining states in the North central Nigeria.

Study Design

This was a facility based prospective longitudinal and analytical study carried out over a period of seven months at the Antenatal Clinic of the Department of Obstetrics and Gynaecology, Federal Medical Centre, Keffi. The study population was consented HIV positive pregnant women attending antenatal care during the period of the study.

Sample Size Calculation

The estimated sample size was determined using the Fisher et al. Formula [8].

$$N = pqZ^2 / d^2$$

Where N=required sample size; Z=1.96 which is standard normal distribution at 95% confidence interval

P= local prevalence rate of previous study on HBV and HIV co-infection among pregnant women=11.8%=0.118 [9].

$$q = 1 - p = 1 - 0.118 = 0.882$$

d= degree of accuracy or precision expected at 5% which is equal to 0.05

$$N = 0.118 \times (1 - 0.118) \times 1.96^2 / 0.05^2 = 159.927$$

$$159.927 \text{ plus } 10\% \text{ attrition}$$

$$= 176$$

Sampling Technique

The sample size of 176 was obtained using Systematic sampling technique. The antenatal clinic in FMC, Keffi runs from Monday to Thursdays excluding public holidays. An average HIV positive client at booking clinic per week was 12 from previous year's record.

The study lasted for 7 months (28 weeks). The study population (N) was equal to 12 multiply by 28 which were equal to 336. The sample size (n) was 176 as calculated using Fisher's formula for sample size determination. The sampling interval equal to N/n which was equal to $336/176 = 1.90$ approximately 2 Using the antenatal boogie register as sampling frame, the 1st client on the list who is HIV positive was selected as the starting point while subsequent clients that meet the inclusion criteria were recruited using a sampling interval of 2, and this continued until the required sample size of 176 clients was obtained.

Data Collection

Structured questionnaires were used to collect data from participants on age, parity, marital status, gestational age, educational level, occupation, history of blood transfusion, history of multiple sexual partners, history of previous surgery, history of tattoo/tribal marks, sharing of sharp objects, female circumcision and previous deliveries conducted by traditional birth attendant.

Collection of Blood sample and HBsAg screening

Each consented participant was made comfortable on a chair in the sample collection room. A tourniquet was applied just above the wrist and the dorsum of the hand was cleaned with methylated spirit. Using 5mls syringe, four (4) mls of venous blood was obtained from each participant. The blood sample was emptied into standard ethylene di-amine tetra acetic acid (EDTA) sample bottle. The collected samples were centrifuged at 4000 rpm for 5 minutes to separate the plasma from blood cells. The one step HBV rapid test using LabAcon strips, sensitivity 99.1% (95% CI 94.9%-100.0%), specificity 99.4% (95% CI 8.6%-99.9%), (Hangzhou Biotest Biotech Co., Ltd, China) was done following the manufacturer's instructions. The rapid test strip was a qualitative membrane based immunoassay for the detection of antibody to HBV in serum or plasma. The membrane was preloaded with recombinant HBV antigen on the test line region of the strip. During testing, the plasma specimen reacted with recombinant HBV antigen conjugated colloid gold. The mixture migrated upward on the membrane chromatographically by capillary action to react with recombinant HBV antigen on the membrane and generate a coloured line. Presence of this coloured line indicates a positive result, while its absence indicated a negative result. To serve as a procedural control, a coloured line always appeared at the control line region indicating that proper volume of specimen was added.

Data Analysis

The data obtained from questionnaires and the laboratory tests were imputed into the statistical package for social sciences (SPSS) version 25.0 (Chicago, USA) and test of associations done using Chi-square and Fisher's exact test. Results were presented in tables and figures.

Results

A total of one hundred and seventy-six (176) HIV positive pregnant women were recruited for the study.

Table 1: Socio-demographic characteristics of HIV positive pregnant women.

Variables	Frequencies	Percentages (%)
Age (years)		
15-19	1	0.6
20-24	7	4.0
25-29	41	23.3
30-34	61	36.6
35 and above	66	7.5
Mean ± SD; Min, Max	32.42±4.99	16.42
Educational status		
None	37	21
primary	21	11.9
secondary	70	39.8
tertiary	48	27.3
Occupation		
Civil servant	27	15.3
Trading	44	25.0
farming	18	10.2
Artisan	25	14.2
student	5	2.8
House wife	48	27.3
Unemployed	9	5.1
Marital status		
Single	1	0.6
Married	175	99.4
Parity		
Nulliparous	20	11.4
Mutliparous	128	72.7
Grand mutliparous	28	15.9

The mean age of the participants was 32.42 years (SD ± 4.99, range 16-42 years). About 70% of the study participants had secondary level of education. Most were married 175 (99.4%) and of these, 39 (22.2%) were in polygamous setting. Majority were housewives 48 (27.3%). One hundred and twenty-eight (72.7%) Of the participants were multiparous with mean parity of 2.53 (SD ± 1.71).

HBV/HIV co-infection occurred more in age range 30 years and above (80%). All co-infected participants were married (100%). Majority had tertiary level of education, 4 (40%). Civil servants and housewives were in majority. None of the socio-demographic variables showed significant association with HBV/HIV co-infection as shown on table three above.

Table 2: Seroprevalence of HBV in HIV positive pregnant women.

Infection	Frequency	Percentage
HIV positive alone	166	94.3
HIV/HBV positive	10	5.7
Total	176	100

Overall, ten of the study participants tested positive to HBV, giving an HBV/HIV co-infection prevalence of 5.7%

Table 3: Bivariate analysis of socio-demographic variables and HBV/HIV co-infection.

Variable	HIV alone	HIV/ HBV	Total	X ² value	P-value
Age (years)	n 166 (%)	n 10 (%)	N 176 (%)		
15-19	1 (0.6)	0 (0.0)	1 (0.6)	1.520	1.000
20-24	7 (4.2)	0 (0.0)	7 (4.0)		
25-29	39 (23.5)	2 (20.0)	41 (23.3)		
30-34	57 (34.3)	4 (40.0)	61 (34.6)		
35 and above	62 (37.3)	4 (40.0)	66 (37.5)		
Marital status					
Single	1(0.6)	0 (0.00)	1 (0.6)	0.06	0.806
Married	165 (99.4)	10 (100)	175 (99.4)		
Occupation					
Civil servant	24 (14.5)	3 (30.0)	27 (15.3)	3.964	0.647
Business	43 (25.9)	1 (10.0)	44 (25)		
Farming	16 (9.6)	2 (20.0)	18 (10.2)		
Artisan	24 (14.5)	1 (10.0)	25 (14.2)		
House wife	45 (27.1)	3 (30.0)	48 (27.3)		
Unemployed	9 (5.4)	0 (0.00)	9 (5.1)		
Student	5 (3.0)	0 (0.00)	5 (2.8)		
Educational status					
None	34 (20.5)	3 (30.0)	37 (21.0)	4.876	0.148
Primary	19 (11.4)	2 (20.0)	21 (11.9)		
Secondary	69 (41.6)	1 (10.0)	70 (39.8)		
Tertiary	44 (26.5)	4 (40.0)	48 (27.3)		

Note: * = Fishers exact derivative values

Table 4: Medical and obstetrics risk factors profile in HBV/HIV co-infected pregnant women:

Variable	HIV alone	HIV/HBV	Total	X ²	p-value
	N 166 (%)	N 10 (%)	N (%)		
Previous surgery					
Yes	47 (28.3)	5 (50.0)	52 (29.5)	2.131	0.163
No	119 (71.7)	5 (50.0)	124 (70.5)		
Previous dental manipulation					
Yes	29 (17.5)	0 (0.00)	29 (16.5)	2.092	0.148
No	137 (82.5)	10 (100)	147 (83.5)		
Previous abortion					
Yes	62 (37.3)	4 (40.0)	66 (37.5)	0.028	0.866
No	104 (62.7)	6 (60.0)	110 (62.5)		
Sharing of sharps/ needle					
Yes	29 (17,5)	0 (0.00)	29 (16.6)	2.092	0.148
No	137 (82.5)	10 (100)	147 (83.5)		
Female circumcision					
Yes	20 (12.0)	0 (0.00)	20 (11.4)	1.359	0.244
No	146 (88.0)	10 (100)	156 (88.6)		
Intravenous drug					
Yes	12 (7,2)	2 (20.0)	14 (7.4)	2.437	0.118
No	154 (92.8)	8 (80.0)	162 (92.6)		

Polygamous marriage					
Yes	36 (21.7)	3 (30)	39 (22.2)	0.378	0.539
No	130 (78.3)	7 (70)	137 (77.8)		
Previous blood transfusion					
Yes	43 (25.9)	4 (40)	47 (26.7)	0.958	0.460
No	123 (74.1)	6 (60)	129 (73.3)		
Previous delivery by TBA					
Yes	42 (35.30)	5 (50)	47 (26.7)	2.940	0.086
No	124 (74.7)	5(50)	129 (73.3)		
Previous multiple sexual partner					
Yes	64 (38.6)	5 (50)	69 (39.2)	0.554	0.457
No	102 (61.4)	5 (50)	107 (60.8)		
Tattoo/tribal marks					
Yes	60 (36.1)	1 (19)	61 (34.7)	2.847	0.083
No	106 (63.9)	9 (90)	115 (65.3)		

Half (50%) of HBV/HIV co-infected women had previous history of surgery, delivery by traditional birth attendant and prior history of multiple sexual partners, but none of all the risk factors considered had significant statistical relationship with HBV/HIV co-infection.

Discussion

The study found a seroprevalence of 5.7% HBV/HIV co-infection among pregnant women attending antenatal care at Federal Medical Centre, Keffi, Nigeria. This is still a rather high prevalence, with grave public health concerns. The seroprevalence obtained was higher than the prevalence of 4.2% found by Eke and colleagues in Nnewi, Southeast, Nigeria [10], 4.2% in Lagos, Southwest, Nigeria by Ezechi and co-workers [11]; 4.7% by Oga and colleagues in Jos [12] but lower when compared to prevalence obtained by Olokoba et al. in Yola, North East, Nigeria [13], 8.9% prevalence rate reported in Ibadan by Adesina et al. [14] and 11.8% reported by Lar and co-workers [9]. The likely explanation to the observed variations in seroprevalence may be due to differences in socio-cultural practices, sample size and test kits sensitivity and specificity.

Studies across Africa have shown variation in the prevalence of HBV/HIV co-infection in pregnancy. When compared with these other African studies, the HBV/HIV co-infection from this study are consistent with the HBV/HIV co-infection prevalence among pregnant women in Sudan (5.6%) and relatively comparable with the 5.3% prevalence registered in South Africa by Hoffmann et al. [15]. The similarity in the prevalence of HBV/HIV co-infection may be due to shared mode of transmission of both viruses as well as regions with the same HBV and HIV endemicity. The obtained prevalence is lower than 14.9% reported by Frempong in Ghana [16], 12.2% prevalence found in Burkina Faso by Ilooudo et al. [17],

19% reported by Zenebe and colleagues in Northwest Ethiopia [18] and 9.0% co-infection prevalence observed in Abidjan by Askari et al. [19]. The observed prevalence is higher than 3.1% registered by Thumbiran et al. in a South African study [2], 4.9% in Ugandan by Ochola et al. [20], 4.7% in Kinshasa, Congo by Mpody et al. [21], 4.1% in Rwanda by Mutagoma and co-workers [3], and 3.2% in Zambia by Sichone and colleague [22]. These variations may be connected to differences in sampling methods, sample sizes, socio-cultural practices, and sexual behaviours. These socio-cultural practices which include female Genital Mutilation, Polygamy, Widowhood inheritance, Sexual cleansing, Wife sharing, virginity testing and dry sex are associated with increased transmission of HBV/HIV and the noted variations is related to the extent of these practices in different study locations. Outside Africa, Mave et al. reported 4.6% in India [23] and Santiago-Munoz et al. obtained a lower prevalence of 1.5% in North American study [24]. This may be due to socio-cultural factors and low endemicity to Hepatitis B virus as well as large sample size used in the North American study. The possible explanations to the low prevalence noted in North America when compared to this study may be due to the practice of monogamy, reduction in other harmful socio-cultural practices such as female genital mutilation, improved blood transfusion services, better awareness of infection prevention strategies due to high literacy level and again, documented evidence of low Hepatitis B endemicity.

There was no association between maternal educational level, occupation, and marital status with HBV/HIV co-infections noted in this study. This agrees with findings of Oga and co-workers in Jos and Zenebe in Ethiopian studies [12,18]. This study noticed a non statistically significant increase in co-infection with maternal age of 30 years and above. This support finding from earlier study by Landes and colleagues that co-infection prevalence is related to maternal age [25]. It is possible that this age group were exposed to the risk factors due to prolonged exposure period as most were multiparous women, again more than two-thirds of the recruited sample population in this study were women of age group 30 years and above. Another consideration may be delay marital age as most had secondary and tertiary levels of education. The noted observation was in contrast to findings by Mutagoma and co-workers that the prevalence of HBV/HIV co-infection was higher in age group 15-24 years [3]. The possible reasons for this observation may be differences in sample size, age distribution of the recruited participants and also, the younger population are known to be more experimental, sexually more active and as such prone to risky behaviours that predisposes them to HBV/HIV infections.

Contrary to findings from Western literature, history of intravenous drug use, sharing of sharp needles were not a significant risk factors. This may not be unconnected with the fact that most people for fear of stigmatization will not admit to the above in our place. Some previously documented risk factors such as surgical and dental procedures and blood transfusion were not significantly associated with HIV/HBsAg in this study probably due to improvement in

safe blood transfusion services, safe surgical techniques and dental procedures. The prevalence of HBV/HIV was not independently associated with female circumcision, multiple sexual partners and delivery by traditional birth attendant. A French study also could not find any significant association between HBV/HIV co-infection and intravenous drug use [26].

Conclusion

HBV/HIV co-infection is still significantly high in the study centre despite decades of consistent multi sectoral campaign for the control and prevention of both diseases. Continual stakeholder engagement is crucial for the prevention and control of both diseases.

Recommendation

Multi-centre study is recommended to identify socio-demographic risk factors to enhanced effective prevention strategies and secondly in view of the relatively high prevalence of HBV in HIV positive pregnant women, routine HBV testing will enable babies of positive mothers to receive prophylactic immunization within 24 hours of birth.

Funding

The entire work was funded by the authors.

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