

## Seroprevalence of Human Immunodeficiency Virus Infection among Infertile Women at a Tertiary Hospital in Sub-Saharan Africa

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### Abstract

**Background:** Since the advent of combination antiretroviral therapy, individuals living with HIV are living longer, with improved quality of life. However, HIV infection has a negative impact on the fertility potential of infected individuals. With the rising number of such individuals intending to exercise their reproductive intentions to have genetic offspring, each fertility clinic should devise strategies to help them realise such.

**Objective:** The objective of this study was to determine the seroprevalence of HIV infection among the infertile women attending our gynaecology clinic.

**Materials and Methods:** This was a cross-sectional study conducted at the gynaecology clinic of the Department of Obstetrics and Gynaecology of the Benue State University Teaching Hospital, Makurdi, Nigeria, from January 1, 2017 to December 31, 2019. Three hundred consecutive infertile women attending the clinic were recruited for the study based on the eligible criteria. Questionnaire was used to obtain the data of each subject. Rapid tests were conducted on the subjects' venous blood to determine their HIV and HBV serostatus. Data were analysed using Statistical Package for the Social Sciences (SPSS), version 25.0. Frequency tables were generated and the level of significance set at less than 0.05.

**Results:** The mean age was 32.32 years. Subjects were predominantly Christians (99%). Majority of them (99%) were married. Nine percent, 49% and 42% had primary, secondary and tertiary education respectively. The HIV seroprevalence of the subjects was 7.7%. The HBV seroprevalence of HIV positive subjects was 69.6%. The HIV and HBV coinfection rate was 65.2%. Spousal HIV seropositivity ( $p = 0.000$ ), tuboperitoneal factor ( $p = 0.006$ ) and HBV seropositivity (0.000) had a statistically significant association with subjects' HIV seropositivity.

**Conclusion:** The HIV seroprevalence of the infertile women in this study was high; the HBV seroprevalence and HBV coinfection rates were also high among the HIV positive subjects. It is pertinent for each fertility clinic to devise strategies to assist HIV positive infertile subjects to achieve their reproductive intentions.

**Keywords:** HIV Seroprevalence, Infertile Women, HBV Seroprevalence, HBV Coinfection, Tertiary Hospital, Sub-Saharan Africa, Bsuth, Makurdi.

### Introduction

Human Immunodeficiency Virus (HIV) infection has become a chronic and manageable disease since the advent of combination antiretroviral therapy (CART) or highly active antiretroviral therapy (HAART) in the 1990s. Individuals living with HIV are now living longer, with improved quality of life. This has led to an increase in their desires and intentions to have their biological or genetic

offspring. In such circumstance, to reduce the risk of both vertical and horizontal transmission, counselling and HIV testing should be carried out for such individuals before attempt at conception [1-3].

Infertility affects up to 15% of reproductive aged couples worldwide, with higher rates in Sub-Saharan Africa. World Health Organization (WHO) demographic studies from 2004 have shown that 30% of women aged 25 - 49 in Sub-Saharan Africa suffer from secondary infertility [2,4]. It is obvious that infertility rates and causes vary widely among and within countries. For instance, the Demographic Health Survey (DHS) and World Fertility Survey (WFS) have

demonstrated the prevalence of infertility in sub-Saharan Africa ranges from 11 to 20 percent in the 27 countries surveyed [5,6].

HIV infection has a negative effect on fertility. An estimated 25 to 40% lower fertility potential has been observed in HIV infected women who are not antiretroviral (ARV) therapy recipients [7]. Many factors may be responsible for the reduced fertility potential in HIV positive individuals compared to their HIV negative counterparts. These include psychosocial and biological factors. Psychosocial factors such as stress, stigmatization and an uncertain future may lead to reduced libido and sexual activity. Other factors are advanced age, white ethnicity, having a CD4 cell count of less than 100 cells/mm<sup>3</sup> and poor adherence to combination antiretroviral therapy. Pelvic inflammatory disease (PID) and genital tuberculosis (causing tubal occlusion) have been reported to have a higher incidence in HIV positive infertile women than their HIV negative counterparts. Hypogonadism, especially the secondary variety, has been associated with reduced fertility in HIV positive men and it is directly related to the clinical stage of the infection. Impaired sperm parameters are also factors that reduce male fertility. Impaired biogenesis of gametes and embryos reduces fertility in HIV positive individuals on CART owing to inhibition of gamete mitochondrial DNA synthesis brought on by the nucleoside reverse transcriptase inhibitors in the combination [8-11]. A recent study reported that HIV infection may have a negative effect on ovarian reserve [12]. Another study reported that despite age-related decline in fertility, HIV infected women tend to lose their ovarian function earlier in life [13].

HIV seroprevalence among infertile couples was 0% in three studies [2,14,15]. It was 8.4% among infertile women in North-western Nigeria and 6.8% among infertile women undergoing laparoscopy and dye test for infertility evaluation in South-eastern Nigeria [16,17].

From the foregoing, it is pertinent that each fertility unit ascertain the HIV seroprevalence of its infertile women population with a view to meeting the reproductive intentions of this special group.

The aim of the study was to determine the seroprevalence of human immunodeficiency virus infection among infertile women attending the gynaecology clinic of the Benue State University Teaching Hospital, Makurdi, and North-central Nigeria.

## Materials and Methods

We conducted a cross-sectional study to determine the seroprevalence of human immunodeficiency virus (HIV) infection among infertile women attending the gynaecology clinic at the Benue State University Teaching Hospital, Makurdi, North-central Nigeria from January 1, 2017 to December 31, 2019.

Consecutive infertile women were recruited for the study. At the end of the study period three hundred (300) infertile women made up the sample size.

Inclusion criteria were reproductive aged infertile women whose HIV serostatus were unknown; reproductive aged infertile women who gave an informed written consent to be recruited into the study.

The exclusion criteria consisted of reproductive aged infertile women whose HIV serostatus were known; reproductive aged infertile women who declined consent to participate in the study.

All subjects gave their informed written consent to participate in the study and have their blood samples and those of their spouses tested. The opt-out HIV testing and counselling method was offered to all the women attending our gynaecology clinic.

Data collection was carried out through a predesigned and pretested questionnaire. It consisted of information on socio-demographics, sexual history, reproductive profile, etc. The causes of infertility were determined by the following investigations: semen analysis, pelvic ultrasonography, hormonal assays, hysterosalpingography and laparoscopy and dye test.

Five (5) millilitres of blood were obtained, placed in vacutainer specimen bottle devoid of anticoagulant, using an aseptic technique; the sample was centrifuged at 5000 revolutions per minute for 5 minutes to separate serum from the blood cells. The serum was then used to detect HIV antibodies. The serum was tested for HIV antibodies using Determine HIV1/2 (Abbot Laboratories Wiesbaden, Germany) and Unigold Recombigen (Trinity Biotech, Co Wicklow, Ireland) rapid tests in parallel.

In case of discrepant test results on a serum sample, Stat-Pak (Chembio Diagnostic System, New York, USA), a third rapid test, was used as a tie-breaker to determine the HIV serostatus of such a subject.

Serum samples from every subject were also assayed for the presence of HBV surface antigen (HBs Ag), using a single step strip test kit (Global Diagnostic USA).

It is a rapid, direct binding test for HBs Ag and based on the principle of sandwich immunoassay in serum. Monoclonal and polyclonal antibodies are employed to identify HBs Ag specifically. It is a very sensitive test. Manufacturers' instructions were strictly followed to identify the serum samples that were seropositive for HIV and HBs Ag respectively.

Data analysis was performed using statistical package for the Social and Health Sciences (version 25.0). Frequency tables were generated and association between HIV sero-prevalence and other variables was determined using chi-square test and setting the level of significance at a P-value of less than 0.05.

## Results

The mean age of the infertile women respondents was 32.32 ( $\pm 5.85$ ) years. The range was 20-49 years.

One hundred and eighty-three (61%) of them were Tivs, 48(16%) were Idomas, 30 (10%) were Igbos and 39 (13%) belonged to other ethnic groups. Two hundred and ninety-seven (99%) and three (1%) of the women practised Christianity and Islam respectively.

Twenty-Seven (9%), one hundred and forty-seven (49%) and one hundred and twenty-six (42%) of the respondents had primary, secondary and tertiary levels of education respectively.

Two hundred and thirteen (71%) were gainfully employed whereas eighty-seven (29%) of the respondents were unemployed.

Two hundred and ninety-seven (99%) of the respondents were married whereas three (1%) were single. The mean duration of

infertility was 6.23 ( $\pm 1.58$ ) years, with a range of 1-29 years.

The HIV serostatus of the subjects and that of their spouses were 7.7% and 4.0% respectively.

The HIV serodiscordance rate was 47.8% (11/23) and HIV seroconcordance rate was 52.2% (12/23). Spousal HIV serostatus had a positive correlation with respondents' HIV seropositivity ( $X^2 = 55.36$ ;  $p = 0.000$ ). Age of respondents ( $X^2 = 23.21$ ;  $p = 0.390$ ), duration of infertility ( $X^2 = 3.52$ ;  $p = 0.998$ ) and the type of infertility ( $X^2 = 0.331$ ;  $P = 0.565$ ) had no statistically significant correlation with the respondents' HIV seropositivity. Secondary infertility was commoner among the respondents than primary infertility (67% vs. 33%).

Tuboperitoneal factor was the commonest cause of infertility among the respondents. There was a statistically significant correlation between tuboperitoneal factors as a cause of infertility among the respondents and their HIV seropositivity ( $X^2 = 53.82$ ;  $P = 0.006$ ). HBs Ag seropositivity among the HIV positive subjects was 69.6%.

HIV seropositivity of subjects had a positive correlation with their HBs Ag seropositivity ( $X^2 = 43.74$ ;  $P = 0.000$ ). HIV and HBV coinfection rate was 65.2% (15/23).

**Table 1: Socio-Demographic Characteristics**

Variables	Frequency (n=300)	
<b>Age</b>		
20-24	15	5
25-29	93	31
30-34	87	29
35-40	69	23
41-44	21	7
45-49	15	5
<b>Ethnicity</b>		
Tiv	183	61
Idoma	48	16
Igbo	30	10
Others	39	13
<b>Religious</b>		
Christianity	297	99
Islam	3	1
<b>Educational Status</b>		
Primary	27	9
Secondary	147	49
Tertiary	126	42
<b>Employment Status</b>		
Unemployed	87	29
Employed	213	71
<b>Marital Status</b>		
Single	3	1
Married	297	99

**Table 2: Duration of Infertility, Parity and Number of Children Alive**

Variables	Frequency (n=300)	Percentage %
<b>Duration of infertility (years)</b>		
1-5	159	53
6-10	114	38
11-15	9	3
16-20	15	5
21-25	0	0
26-30	3	1
<b>Parity</b>		
0	177	59
1	66	22
2	36	12
3	12	4
4	6	2
5	3	1
<b>Number of Children</b>		
0	189	63
1	81	27
2	21	7
3	3	1
4	3	1
5	3	1

**Table 3: HIV Serostatus of Respondents and their Spouses**

Variables	Frequency (n=300)	Percentage %
<b>Respondents' HIV Serostatus</b>		
Positive	23	7.7
Negative	277	92.3
<b>Spousal HIV Serostatus</b>		
Positive	12	4.0
Negative	288	96.0

**Table 4: Association between Respondent Respondents' HIV Serostatus and spousal HIV Serostatus**

Variables	Frequency (n=300)	Percentage %	$X^2$ ; P-Value
<b>HIV Serostatus</b>	<b>Positive</b>	<b>Negative</b>	$X^2 = 55.357$ $P = 0.000$
	Respondents'	23(7.7) 277(92.3)	
	Spousal	12(4.0) 288(96.0)	

**Table 5: Association between HIV Serostatus of Respondents and the Type of Infertility**

Variables	Frequency (n=300)	Percentage %	X <sup>2</sup> ; P-Value
<b>HIV Serostatus</b>	<b>Positive</b>	<b>Negative</b>	X <sup>2</sup> = 55.357 P = 0.000
Primary infertility	11(3.7)	88(29.3)	
Secondary infertility	12(4.0)	189(63.0)	

**Table 6: Association between HIV Serostatus and Causes of Infertility**

Variables	Frequency (%) HIV Positive n = 23	HIV Negative n = 277	X <sup>2</sup> ; P-Value
Tuboperitoneal	16(69.6)	148(53.4)	X <sup>2</sup> = 53.82 P=0.006
PCOS	2(8.7)	23(8.3)	X <sup>2</sup> = 47.53 P=0.857
Uterine Factor	1(4.3)	14(5.1)	X <sup>2</sup> = 34.64 P=0.639
Male Factor	4(17.4)	92(33.2)	X <sup>2</sup> = 23.78 P=0.092

**Table 7: Association between respondents' HIV Serostatus and HBs Ag Serostatus**

Variables	Frequency (%) HIV Positive n = 23	HIV Negative n = 277	X <sup>2</sup> ; P-Value
<b>HBsAg Serostatus</b>			
Seropositive	7(30.4)	35(12.6)	X <sup>2</sup> = 43.74 P = 0.000
Seronegative	16(69.6)	242(87.4)	

## Discussion

The mean age of 32.32 years among respondents in this study was less than the mean age of 34.00 years reported by Coll et al., [18]. It was similar to the mean age of 32.70 years reported by Olaitan et al., among infertile women with HIV infection [19]. However, it was greater than the mean ages of 30.00 years reported by Yahya et al., and 27.98 years by Nikbakht et al., respectively [2,16].

The HIV seroprevalence 7.7% among the respondents was higher than the national HIV seroprevalence of 1.4% in Nigeria and HIV seroprevalence rate of 0.011% (0.11/1000) reported among infertile patient by Zuzuarregui et al., [20,21].

It was, however, less than the HIV seroprevalence of 8.4% reported by Yahya et al., in a similar study in North-western Nigeria [16].

Secondary infertility was the commonest type of infertility among the respondents, occurring in 67.0% of them. This was lower than the 81.0% prevalence of secondary infertility among HIV-positive respondents reported by Yahya et al., [16]. There was no statistically significant relationship between respondent's HIV seropositivity and the type of infertility ( $\chi^2 = 0.331$ ;  $p = 0.565$ ). A study reported

that the global prevalence of infertility had remained stable over the years with a small reduction in primary infertility and a slight overall increase in secondary infertility; another study reported a higher prevalence of secondary infertility over primary infertility in developing countries, especially sub-Saharan Africa [22,23].

Tuboperitoneal factor was the commonest cause of infertility among the respondents. The HIV positive infertile subjects had higher tuboperitoneal infertility rate than their HIV negative counterparts (69.6% vs. 53.4%).

There was a statistically significant correlation between HIV seropositivity of subjects and tuboperitoneal factor as a cause of infertility ( $X^2 = 53.82$ ,  $p = 0.006$ ). This was lower than the tuboperitoneal cause of infertility of 81% among HIV positive infertile women reported by Yahya et al., and higher than the tubal occlusion rate of 27.8% among HIV positive infertile women reported by Coll et al., [16,18].

Hepatitis B surface Antigen (HBs Ag) seropositivity among the HIV positive subjects was 30.4% compared to a rate of 12.6% HBs Ag seropositivity among the HIV negative subjects.

Lao et al., and Zangeneh et al., reported lower HBs Ag seropositivity of 6.3% and 0.57% among infertile women respectively [24,25].

There was a statistically significant correlation between HIV seropositivity and HBs Ag seropositivity among the subjects ( $X^2 = 43.74$ ,  $p = 0.000$ ).

The HIV and HBV co-infection rate was of 65.2%. This was lower than the co-infection rate of 73.6% among female subjects in a study conducted in Kano, Nigeria [26].

## Conclusion

The HIV seroprevalence of 7.7% among the infertile women in this study was high compared to the national seroprevalence of 1.4%. Hepatitis B virus seroprevalence and HBV coinfection were also high in the HIV positive subjects.

## Limitation

The main limitation was the loss of a large number of potential subjects owing to their refusal to be tested for both HIV and HBV infections.

## Recommendation

Given the high seroprevalence of HIV infection among infertile clients in our setting, all fertility units should spare no effort in devising measures to meet the peculiar reproductive intentions of such clients. The option of adoption should also be factored into meeting such intentions. This study should serve as a primal for further studies on this largely unmet component of reproductive health in our setting.

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