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A Comparison of the Predictors of Abnormal Cervical Cytology among HIV-Positive and HIV-Negative Women Attending Lagos University Teaching Hospital, Nigeria

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ABSTRACT

Background: Women living with Human Immunodeficiency Virus (HIV) are at increased risk of developing premalignant cervical lesions compared with the general population. This study assessed and compared the prevalence and predictors of abnormal cervical cytology among HIV-positive and HIV-negative women attending Lagos University Teaching Hospital, Nigeria.

Methods: A comparative cross-sectional study was conducted among asymptomatic HIV-positive women attending the AIDS Prevention Initiative in Nigeria Clinic and HIV-negative women attending the General Out-Patient Department Clinic. Cervical cytology samples from 441 participants (232 HIV-positive and 209 HIV-negative), selected using systematic random sampling, were evaluated using the Bethesda Classification System. Data were collected using interviewer-administered questionnaires and analyzed with SPSS version 26. Associations were assessed using chi-square tests and multivariable logistic regression at a 5% significance level.

Results: The prevalence of abnormal cervical cytology was significantly higher among HIV-positive women (27.6%) compared to HIV-negative women (5.7%) ($p<0.001$). A significant difference was observed in the mean ages at sexual initiation among these two groups of women with abnormal cytology. HIV-negative status (adjusted Odds Ratio [aOR]=0.15; 95% Confidence Interval [CI]: 0.07–0.30; $p<0.001$) and age 30–39 years (aOR=0.38; 95% CI: 0.16–0.92; $p=0.032$) were associated with lower odds of abnormal cytology, while high parity (≥3) increased the odds (aOR=2.54; 95% CI: 1.41–4.58; $p=0.002$).

Conclusion: Abnormal cervical cytology was significantly more prevalent among women living with HIV. HIV status, age, and parity were key predictors. Strengthened and targeted cervical cancer screening strategies are recommended for HIV-positive women to facilitate early detection and timely intervention.

Keywords: Cervical cancer, HIV, Abnormal cytology, Prevalence, Predictors, Lagos.

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INTRODUCTION

Cancer of the cervix remains a public health challenge worldwide, especially in low- and middle-income countries. Globally, cervical cancer is the fourth leading cause of female cancer, the fourth leading cause of cancer death among women, and is the second most common female cancer in women aged 15 to 44 years.[1,2] According to the World Health Organization (WHO), an estimated 604,127 new cervical cancer cases and 341,831 deaths of women (particularly middle-aged women) from cervical cancer occurred globally in 2020, with nearly 90% of deaths occurring in resource-limited settings.[3,4] Persistent infection with high-risk Human Papillomavirus (HPV) is the primary cause of cervical cancer, and abnormal cervical cytology represents a precursor stage in the progression from HPV infection to invasive disease.

Women living with Human Immunodeficiency Virus (HIV) are disproportionately affected by HPV infection and its sequelae due to immunosuppression.[5] HIV infection not only increases the risk for cervical cancer but also increases the rates of recurrence after treatment of precancer [6] and reduces life expectancy.[7] Evidence indicates that HIV-positive women have higher rates of persistent HPV infection, Cervical Intraepithelial Neoplasia (CIN), and invasive cervical cancer compared with HIV-negative women.[5,8] Nigeria bears one of the largest burdens of HIV globally, with an estimated 1.9 million people living with HIV.[9,10] The interaction between HIV and HPV, therefore, represents a significant co-morbidity that threatens women's reproductive health.

Screening for early detection of precancerous lesions is an effective strategy for the secondary prevention of cervical cancer. To decrease the burden of cervical cancer, cervical intraepithelial lesions must be diagnosed on time and treated. Conventional cytology, or Papanicolaou (Pap) smear screening, was developed by Dr. George Papanicolaou in 1940 and has been in use for many years to detect cervical dysplasia and carcinoma in many developing countries.[11,12]

Despite the established association between HIV infection and cervical abnormalities, there is limited comparative data on the predictors of abnormal cervical cytology among HIV-positive and HIV-negative women in tertiary facilities in Lagos, Nigeria. Most local studies focused primarily on prevalence rather than identifying and contrasting predictive factors such as age, parity, sexual behaviour, and other reproductive status. Without such comparative evidence, targeted screening strategies and risk-based interventions may be suboptimal.

Understanding differential predictors of abnormal cervical cytology among HIV-positive and HIV-negative women is essential for optimizing screening policies, resource allocation, and preventive interventions. The WHO's global strategy to eliminate cervical cancer emphasizes risk-based screening, particularly for women living with HIV, who require more frequent surveillance.[13] Generating local evidence from Lagos University Teaching Hospital (LUTH), a major referral centre in Nigeria, will support context-specific policy decisions, improve early detection, and contribute to reducing cervical cancer morbidity and mortality in high-burden settings. This study aimed to assess and compare the prevalence and the sociodemographic as well as reproductive predictors of cervical cytological abnormalities of the cervix among HIV-positive and HIV-negative women attending LUTH, Lagos, Nigeria.

MATERIALS AND METHODS

Study area and site: Lagos State, located in South-West Nigeria, is the smallest state by landmass but the most populous in Nigeria, with over 20 million residents.[14,15] As Nigeria's commercial capital, it is highly urbanized and densely populated.[16] The state has 20 LGAs and a mix of public and private health facilities. Lagos also has a significant HIV burden,[17] making it suitable for this study. This hospital-based study was conducted at LUTH, the teaching hospital of the College of Medicine, University of Lagos, located in Idi-Araba, Surulere, Lagos Mainland. [18] This hospital provides specialized services, including HIV care and cervical cancer screening, such as Pap smear and cytopathology.[19] LUTH collaborates with the AIDS Prevention Initiative in Nigeria (APIN), a non-governmental organization established in 2000 to support HIV/AIDS prevention, treatment, and research.

Study Design and Population: A comparative cross-sectional study design was used in this study. The study populations were HIV-positive women attending the APIN clinic of LUTH for care and treatment, and HIV-negative women attending the General Out-Patients Clinic at GOPD of LUTH in Lagos. Consenting HIV-positive and HIV-negative women aged 30-60 years (eligible age for cervical cancer screening) were included in this study. Women who were menstruating or pregnant, those with a history of HPV screening in the past 5 years or cervical cytology in the past 3 years, or

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those who have had previous total hysterectomies performed on them for benign disease or previous treatment for cervical cancer were excluded from this study. Women who have never had sexual intercourse were also excluded from this study.

Sample Size Determination: The minimum sample size was calculated using the formula for comparing two independent proportions, [20] based on the prevalence of abnormal cervical cytology of 28.2% among HIV-positive women in Nnewi, Nigeria. [21] An expected difference of 15%, a confidence interval of 95%, and a power of 90% were used in this calculation. With an allowance of 20% as a non-response rate, a minimum sample size of 178 women per group was estimated.

Sampling Technique: A systematic random sampling technique was used for the selection of study participants. An average of twenty new women were registered in APIN and GOPD clinics of LUTH for assessment, care, and treatment daily, then the total number of women who were registered over eight weeks was 800. The sampling interval (k) was [Total Population (800)/Expected Study Participants (200)] set at 4. One woman was selected by a simple random sampling method (balloting) among the first four female patients who attended the clinics; subsequently, every nth (fourth to the selected number) woman was selected. If the selected woman was not eligible, the available (next to the selected woman) was recruited to a minimum of 5 women and a maximum of 8 women per day. These clinics ran every day of the week, and this study was conducted over two months.

Data collection and analysis: Data were collected using a pretested, structured, and interviewer-administered questionnaire. The questionnaire assessed the socio-demographic and reproductive status of the respondents.

To confirm the HIV status of the participants, the HIV test results of the participants in APIN were retrieved and documented, while the participants in the GOPD clinic had the rapid screening test for HIV done by the trained Voluntary Counselling and Testing (VCT) Officer at the Out-Patients Departments of LUTH. The VCT Officer did a pre-test counselling for all the participants who were screened for HIV. All the participants from the GOPD clinic had negative results for HIV screening.

Selected study participants were invited into a separate room designated for the study in the two clinics. In the room, there were tables and chairs for the respondents and the attending research team members, a table for the sample collection materials, an examination couch, and a screen in the room. The study participants then signed the informed consent form, after which they were interviewed using the pretested, structured, interviewer-administered questionnaire by the trained research assistants. All completed questionnaires were checked by the researcher for completeness and consistency.

The sample collection for Pap smear was done by trained clinicians, including a trained Oncology Gynaecologist, assisted by a Medical Officer and a chaperone. The clinician explained the procedure to the participant. The participant undressed from the waist down and lay on her back in dorsal position on an examination couch with the knees bent and the heels resting in supports. The clinician gently inserted a sterile bivalve disposable speculum into her vagina to hold the walls of the vagina apart so that the cervix was clearly seen. The vagina wall and cervix were inspected for the presence of tumours and other diseases. The cervical cells for the conventional Pap smear were taken by rotating the tip of the Ayres spatula 360^0 at the endocervix to collect cervical cells. The cells were smeared onto a labelled slide and fixed with alcohol for 30 minutes in a Coplin Jar containing 95% ethanol. The sample was taken to the Department of Anatomic and Molecular Pathology of the College of Medicine, University of Lagos, with a laboratory form for individual participants to determine if there was any cervical lesion in each sample.

The conventional Pap smears were stained by the Papanicolaou staining technique. All the slides were examined with the light microscope by a Professor of Anatomic and Molecular Pathology and were reported using the Bethesda system 2014 for reporting terminology for cervical cytology. The result of cytology was assessed as either satisfactory or unsatisfactory. The specimen was satisfactory if they contain well preserved and well-visualised squamous cells along with cells from the transformation zone. An unsatisfactory specimen was due to scanty cells, improper fixation of the slide, debris, mucus, blood cells, inflammation, and other factors that obscure 75% or more of epithelial cells. Satisfactory samples were assessed using the Bethesda system and subdivided as Negative for Intraepithelial Lesion or Malignancy (NILM) (including non-neoplastic findings) or epithelial cell abnormality including squamous cell (Atypical Squamous Cells of Undetermined Significance [ASCUS] and Atypical

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Squamous Cells for which high-grade lesions could not be excluded [ASC-H]), Low-grade Squamous Intraepithelial Lesion (LSIL), High-grade Squamous Intraepithelial Lesion(HSIL), Squamous Cell Carcinoma (SCC) and glandular cell (including Atypical Glandular Cell (AGC) and adenocarcinomas. The cytology result for each patient was documented, written, and signed.

The participants were contacted through their telephone numbers or on their clinic appointment dates, and they were notified about their results. Participants who had negative test results were assured and informed about when to repeat the test, which was 3 years for those who were negative for intraepithelial lesion or malignancy. Participants with abnormal cytology results were referred immediately for colposcopy-directed biopsy at the Colposcopy unit in LUTH for further assessment.

The cytology results were classified as normal or abnormal. While NILM was classified as normal, other epithelial cell lesions were classified as abnormal. The cut-off points used for the abnormal cytology results were ASCUS or higher (including AGUS, ASC-H, LSIL, and HSIL). Descriptive statistics were used to describe the sociodemographic and reproductive characteristics of the participating HIV-positive and HIV-negative women as related to having abnormal cytology. Associations between continuous variables were tested using the independent sample t-test. Multivariate analysis using a binary logistic regression model was used to control for the effect of confounders on the study endpoint, and then the odds ratio (OR) at 95% confidence interval (CI) was used to determine the strength of associations. Bivariate analysis was conducted to estimate crude odds ratios (cOR). Variables with $p < 0.20$ and those of epidemiological relevance were included in the multivariate logistic regression model to obtain adjusted odds ratios (aOR) with 95% confidence intervals. Unstable variable such as Tribe was later excluded from the model because the initial output suggests instability in the estimate (constant odds ratio and confidence interval), indicating possible sparse data or model fitting issues for this variable. The final model included HIV status, age, age at first pregnancy, and parity. Statistical significance was reported at $p < 0.05$.

Ethical Considerations: The study proposal was approved by the College of Medicine, University of Lagos, Research and Ethics Committee on the 2nd of November 2021 with reference number CMUL/HREC/09/21/921. Permission was also sought from the heads of the clinics (APIN and GOP Clinics), and approval was received before the commencement of this study. Written informed consent was obtained from all participants before the interview. Participation was voluntary, and confidentiality was maintained. All the study participants received health education on cervical cancer and the preventive methods, and they were all given the contact information to call for further assistance. Participants with abnormal Pap smear results were referred to the Gynaecology Unit of LUTH for further evaluation and treatment. All the procedures were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

RESULTS

The HIV-positive women were slightly older compared to the HIV-negative women, with the mean age of 42.63±7.44 years and 42.30±8.68 years, respectively. A higher proportion of HIV-negative women, 166(79.4%), were married compared to 149(64.2%) of HIV positive women. Concerning the level of education, HIV-negative women were more educated by having a tertiary education than the HIV positive women in this study. (Table 1)

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Table 1: Socio-demographic characteristics of the respondents by HIV status

Variable	HIV positive n=232 Freq. (%)	HIV negative n=209 Freq. (%)	Total n=441 Freq. (%)
Age (years)			
30-39	81 (34.9)	87 (41.6)	168 (38.1)
40-49	108 (46.6)	70 (33.5)	178 (40.4)
≥50	43 (18.5)	52 (24.9)	95 (21.5)
Mean ± SD	42.63 ± 7.44	42.30 ± 8.68	42.47 ± 8.05
Marital status			
Not married	83 (35.8)	43 (20.6)	126 (28.6)
Married	149 (64.2)	166 (79.4)	315 (71.4)
Educational level			
Primary	49 (21.1)	63 (30.1)	112 (25.4)
Secondary	103 (44.4)	37 (17.7)	140 (31.7)
Tertiary	80 (34.5)	109 (52.2)	189 (42.9)
Tribe			
Yoruba	84 (36.2)	137 (65.6)	221 (50.1)
Others**	148 (63.8)	72 (34.4)	220 (49.9)

** Igbo, Hausa, Igala, Ijaw, Irhobo, Igbira, Edo, Calabar

Table 2 shows the comparison of the reproductive and sexual histories of the respondents by HIV status. A higher proportion of HIV-negative women 155(74.2%) attained menarche before the age of 16 years compared to 163(70.3%) of HIV-positive women. Most of the HIV-negative women [164(78.5%)] had their first sexual intercourse (sexual initiation) after age 16 years compared to the proportion of HIV-positive women [189(81.5%)] who had the first sexual intercourse after 16 years of age. While a higher proportion of the HIV-positive women [163(70.3%)] had more than one lifetime sexual partners compared to the proportion HIV-negative women, 131(62.7%), a higher proportion of the HIV-negative women, 43(20.6%), used hormonal contraceptive in their lifetime compared to the proportion of the HIV-positive women [29(12.5%)].

Table 2: Reproductive and sexual histories of the respondents by HIV status

Variable	HIV positive n=232 Freq. (%)	HIV negative n=209 Freq. (%)	Total n=441 Freq. (%)
Age at menarche (years)			
≥16	69 (29.7)	54 (25.8)	123 (27.9)
<16	163 (70.3)	155 (74.2)	318 (72.1)
Mean ± SD	14.50 ± 1.99	14.50 ± 1.99	14.50 ± 1.99
Age at sexual initiation(years)			
<16	43 (18.5)	45 (21.5)	88 (20.0)
≥16	189 (81.5)	164 (78.5)	353 (80.0)
Mean ± SD	20.27 ± 3.95	20.35 ± 4.30	20.31 ± 4.11
Number of lifetime sexual partners			
One	69 (29.7)	78 (37.3)	147 (33.3)
More than one	163 (70.3)	131 (62.7)	294 (66.7)
Mean ± SD	2.71 ± 2.04	2.67 ± 2.16	2.69 ± 2.10
Lifetime contraceptive use			
None	179 (77.2)	106 (50.7)	285 (64.6)
Hormonal	29 (12.5)	43 (20.6)	72 (16.3)
Others**	24 (10.3)	60 (28.7)	84 (19.0)
Ever been pregnant			
Yes	216 (93.1)	183 (87.6)	399 (90.5)
No	16 (9.6)	26 (12.4)	42 (9.5)
Age at first pregnancy (years)	**n=216**	**n=183**	**n=399**
≥20	155 (71.8)	159 (86.9)	314 (78.7)
<20	61 (28.2)	24 (13.1)	85 (21.3)
Mean ± SD	23.95 ± 5.01	26.18 ± 5.10	24.97 ± 5.16

**Natural method, barrier method, intrauterine device, bilateral tubal ligation

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The prevalence of abnormal cervical cytology among HIV-positive and HIV-negative women is shown in **Table 3**. Majority of the HIV-positive [168(72.4%)] and HIV-negative women [197(94.3%)] in this study had negative smear (apparently normal cervical cytology), which is classified as Negative for Intraepithelial Lesion or Malignancy (NILM). A statistically significantly higher proportion of HIV-negative women (94.3%) compared to HIV-positive women (72.4%) in this study had negative smear results (p<0.0001). The prevalence of abnormal cervical cytology among HIV-positive women was 64(27.6%); of these were AGUS – 6(9.4%), ASCUS – 25(39.1%), ASC-H – 8(12.5%), LSIL – 10(15.6%) and HSIL – 15(23%). The prevalence of abnormal cervical cytology among HIV-negative women was 12(5.7%); of these were AGUS – 4(33.3%), ASCUS – 6(50.0%) and ASC-H – 2(16.7%). The prevalence of abnormal cervical cytology was statistically significantly higher among HIV-positive women (27.6%) than HIV-negative women (5.7%) (p<0.0001).

Table 3: Comparison of the prevalence of abnormal cytology among the respondents by HIV status

Variable	HIV positive n=232 Freq. (%)	HIV negative n=209 Freq. (%)	Total n=441 Freq. (%)	Chi square χ^2	p value
Different Pap Smear Results					
NILM	168 (72.4)	197 (94.3)	365 (82.8)	41.864	<0.0001 ‡†
AGUS	6 (2.6)	4 (1.9)	10 (2.3)		
ASCUS	25 (10.8)	6 (2.9)	31 (7.0)		
ASC-H	8 (3.4)	2 (1.0)	10 (2.3)		
LSIL	10 (4.3)	0 (0.0)	10 (2.3)		
HSIL	15 (6.5)	0 (0.0)	15 (3.4)		
Cervical cytology					
No abnormal cytology (NILM)	168 (72.4)	197 (94.3)	365 (82.8)	36.784	<0.0001 †
Any abnormal cytology	64 (27.6)	12 (5.7)	76 (17.2)		
Abnormal cervical cytology	**n = 64**	**n = 12**	**n = 76**		
AGUS	6 (9.4)	4 (33.3)	10 (13.2)	12.366	0.015 ‡†
ASCUS	25 (39.1)	6 (50.0)	31 (40.8)		
ASC-H	8 (12.5)	2 (16.7)	10 (13.2)		
LSIL	10 (15.6)	0 (0.0)	10 (13.2)		
HSIL	15 (23.0)	0 (0.0)	15 (19.7)		

† - Statistically significant, ‡ - Likelihood Ratio, NILM – Negative for Intraepithelial Lesion or Malignancy, AGUS – Atypical Glandular Cells of Undetermined Significance, ASCUS – Atypical Squamous Cells of Undetermined Significance, ASC-H – Atypical Squamous Cells, cannot exclude High-grade squamous intraepithelial lesion, LSIL – Low-grade Squamous Intraepithelial Lesion, HSIL – High-grade Squamous Intraepithelial Lesion.

Table 4 shows the characteristics of the HIV-positive and HIV-negative women with any abnormal cervical cytology results on the Pap smear test. There was a statistically significant difference in the mean age at sexual initiation of the HIV-positive and HIV-negative women who had any abnormal cervical cytology using the Pap smear test. There were no statistically significant differences in the mean age, mean age at menarche, mean number of lifetime sexual partners, mean age at first pregnancy, mean number of pregnancies, and mean number of vaginal deliveries among the HIV-positive and HIV-negative women with any abnormal cervical cytology in this study.

Table 4: Comparison of the characteristics of the respondents with abnormal cervical cytology by HIV status

Variable (Continuous)	HIV positive n=64 Mean ± SD	HIV negative n=12 Mean ± SD	Total n=76 Mean ± SD	T-Test	p value
Age (years)	42.02 ± 6.67	41.83 ± 7.10	41.99 ± 6.69	0.086	0.969

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Variable (Continuous)	HIV positive n=64 Mean ± SD	HIV negative n=12 Mean ± SD	Total n=76 Mean ± SD	T-Test	p value
Age at menarche (years)	14.53 ± 1.88	14.75 ± 2.30	14.57 ± 1.93	0.357	0.192
Age at sexual initiation (years)	19.33 ± 2.76	21.58 ± 6.29	19.68 ± 3.59	2.039	<0.0001†
Number of lifetime sexual partners	2.92 ± 1.62	2.75 ± 2.30	2.89 ± 1.73	0.315	0.089
Age at first pregnancy (years)	24.30 ± 5.56	26.10 ± 5.20	24.55 ± 5.51	0.960	0.689
Number of pregnancies	4.52 ± 2.49	3.80 ± 1.75	4.42 ± 2.41	0.881	0.494
Number of vaginal deliveries	2.93 ± 1.67	3.20 ± 1.62	2.97 ± 1.66	0.467	0.986

† Statistically significant

Predictors of having any abnormal cervical cytology among the HIV-positive and HIV-negative women in this study on bivariate and multivariate logistic regression models are shown in **Table 5**. HIV status, age, and number of vaginal deliveries were significant predictors of having any abnormal cervical cytology in this study. In the bivariate analysis, HIV status and age group (40–49 years) were significantly associated with abnormal cervical cytology. Respondents who were HIV-negative had significantly lower odds of abnormal cytology compared to HIV-positive individuals (Crude Odds Ratio [OR] = 0.18; 95% Confidence Interval [CI]: 0.08–0.37; $p < 0.001$). Additionally, respondents aged 40–49 years had higher odds compared to those aged ≥50 years (cOR = 2.50; 95% CI: 1.06–5.91; $p = 0.037$).

In the adjusted (multivariate) logistic regression model, after adjusting for potential confounders, HIV status, age (30–39 years), and parity were independently associated with abnormal cervical cytology. Respondents who were HIV-negative had significantly reduced odds of abnormal cytology compared to those who were HIV-positive (aOR = 0.15; 95% CI: 0.07–0.30; $p < 0.001$). Respondents aged 30–39 years had significantly reduced odds of abnormal cytology compared to those aged ≥50 years (aOR = 0.38; 95% CI: 0.16–0.92; $p = 0.032$), whereas the association observed among those aged 40–49 years was no longer statistically significant after adjustment. Parity remained a strong predictor, with respondents who had three or more vaginal deliveries having over twice the odds of abnormal cytology compared to those with fewer than three deliveries (aOR = 2.54; 95% CI: 1.41–4.58; $p = 0.002$).

Other characteristics such as age at menarche, age at sexual initiation, number of lifetime sexual partners, age at first pregnancy, marital status, level of education, tribe, and history of hormonal contraceptive use did not demonstrate a statistically significant association in either bivariate or multivariate analysis and were not retained in the models. The model demonstrated acceptable or good fit and moderate explanatory power.

Table 5: Predictors of having abnormal cervical cytology among all the respondents

Characteristics	cOR (95% CI)	p value	aOR (95% CI)	p value
HIV status				
Positive (Ref)	1			
Negative	0.18 (0.08 – 0.37)	<0.001 †	0.15 (0.07–0.30)	<0.001 †
Age (years)				
≥50 (Ref)	1			
40-49	2.50 (1.06 – 5.91)	0.037 †	0.93 (0.50–1.72)	0.810
30-39	2.35 (0.95 – 5.85)	0.066	0.38 (0.16–0.92)	0.032 †
Age at menarche (years)				
≥16 (Ref)	1			
<16	0.39 (0.46 – 1.51)	0.547	----	--
Age at sexual initiation (years)				
≥16 (Ref)	1			
<16	0.50 (0.14 – 1.73)	0.271	----	--

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Characteristics	cOR (95% CI)	p value	aOR (95% CI)	p value
Lifetime sexual partners				
Multiple (Ref)	1			
Single	0.72 (0.39 – 1.36)	0.318	----	--
Age at first pregnancy (years)				
≥20 (Ref)	1			
<20	2.10 (0.98 – 4.50)	0.056	0.54 (0.27–1.09)	0.084
Number of vaginal deliveries				
<3 (Ref)	1			
≥3	2.10 (0.98–4.50)	0.056	2.54 (1.41–4.58)	0.002 †
Marital status				
Not married (Ref)	1			
Married	1.02 (0.53 – 1.96)	0.954	----	--
Level of education				
Tertiary (Ref)	1			
Secondary and below	0.97 (0.53 – 1.77)	0.925	----	--
Tribe				
Yoruba (Ref)	1			
Others **	1.50 (0.84 – 2.70)	0.173*	----	--
Ever used hormonal contraceptives				
Yes (Ref)	1			
No	0.86 (0.41 – 1.82)	0.697	----	--

Note: † Statistically significant, ** Igbo, Hausa, Igala, Ijaw, Irhobo, Igbira, Edo, Calabar, * Not included in the model
Abbreviations: Ref – Reference value, cOR -Crude Odds Ratio, aOR – Adjusted Odds Ratio, CI – Confidence Interval

DISCUSSION

Studies have shown that abnormal cervical cytology is more prevalent among HIV-positive women than HIV negative women.[22–30] A systematic global review on the incidence and progression of cervical lesions in HIV-positive women showed a median 3-fold higher incidence of cervical lesions in HIV-positive women compared to HIV-negative women.[22]

However, the prevalences observed in this study were lower than those reported in a similar study at the University of Abuja Teaching Hospital, Nigeria.[31] The reason for these high prevalence rates is unclear, and information on whether the HIV-positive women were on treatment for HIV was not provided; hence, the high prevalence may be attributed to reduced immunity among HIV-positive women in that population. The study attributed this varying prevalence to the differences in the study population. Similarly, the prevalence of abnormal cervical cytology was higher in a cross-sectional study from Port Harcourt, Nigeria, where 34.4% of the HIV-positive women had abnormal cervical smears compared to 20.2% HIV-negative women. The study was conducted in Port Harcourt, Nigeria, with reports of multiple sexual partners (81.7%) among the adolescents, [32] which is a known risk factor for HPV infection and cervical dysplasia. The proportion of high-grade lesions and squamous intraepithelial lesions was significantly higher among HIV-positive women (23.5%) than among HIV-negative women (8.2%) in Port Harcourt, [33] and Lagos,[34] respectively. These prevalences were also higher than those reported in this study.

This study identified a statistically significant difference in the mean age at sexual initiation between HIV-positive and HIV-negative women with abnormal cervical cytology. Conversely, the study found no statistically significant differences between these two groups regarding the mean age, mean age at menarche, mean number of lifetime sexual partners, mean age at first pregnancy, mean number of pregnancies, and mean number of vaginal deliveries. The findings suggest that among women with abnormal cytology, early sexual initiation was a distinguishing factor between the HIV-positive and HIV-negative groups, while other demographic and reproductive factors were similar. The primary implication of these findings is that early sexual initiation acts as a critical, independent risk factor for cervical abnormalities in this population, whereas other common reproductive factors (like number of pregnancies or age at menarche) do not distinguish between the two groups. This suggests that early exposure to HPV occurs when the adolescent cervix is

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biologically more susceptible to persistent infection and subsequent cellular changes.[35] Because HIV-positive women often have an earlier sexual debut and a higher risk of rapid progression to cancer, major health organizations like the WHO now recommend that they begin cervical screening at age 25, which is five years earlier than the general population.[13] The findings emphasize that public health interventions should prioritize delaying the age of first sexual intercourse and implementing early HPV vaccination to reduce the long-term risk of cervical cancer, particularly for those living with HIV.

HIV status, age, and number of vaginal deliveries were significant predictors of having any abnormal cervical cytology in this study in bivariate analysis. This refined multivariate analysis confirms that HIV infection and high parity are key independent predictors of abnormal cervical cytology. The strong protective association observed among HIV-negative individuals reinforces existing evidence linking immunosuppression in HIV-positive women to increased susceptibility to persistent high-risk HPV infection and subsequent cervical abnormalities, thereby increasing the risk of cervical dysplasia and progression to malignancy. [3,36]This finding supports ongoing recommendations for intensified cervical cancer screening among women living with HIV, particularly in high-burden settings.[13]

The association between high parity and increased odds of abnormal cytology is consistent with biological and epidemiological evidence.[37] Multiple pregnancies may increase susceptibility to cervical abnormalities through repeated cervical trauma, hormonal influences during pregnancy, and prolonged HPV exposure. This underscores the importance of targeted screening interventions among multiparous women.

Interestingly, respondents aged 30–39 years were significantly less likely to have abnormal cervical cytology compared to older women. This may reflect the cumulative nature of cervical cancer risk, where prolonged exposure to risk factors such as persistent HPV infection increases the likelihood of abnormal cytology with advancing age.[36,38] Although age at first pregnancy was not statistically significant, the observed protective trend aligns with the literature and is consistent with evidence suggesting that delayed sexual debut and reproductive activity may reduce early exposure to HPV.[35,39] The attenuation of the association between age (40–49 years) and abnormal cytology after adjustment suggests the presence of confounding, particularly by parity and HIV status. This underscores the importance of multivariate analysis in identifying independent predictors. The refined model demonstrated good fit and stability after removal of sparse variables, indicating robustness of the identified associations. Overall, the findings reinforce the importance of integrating cervical cancer screening into routine healthcare services, especially for high-risk groups such as HIV-positive women and those with high parity.

However, a study from Sagamu reported that there was no statistically significant association between HIV status and severity of cervical lesion ($p=0.162$).[30] The study also found that variables such as age, parity, educational status, age at coitarche, number of sexual partners, and use of ART had no significant association with the occurrence of abnormal cervical cytological smear, but found that the CD4 cell count of HIV-positive women is a strong predictor of an abnormal cervical cytology smear. Recognized risk factors for premalignant and malignant cervical lesions include advanced age, high parity, and multiple sexual partners, which can increase the risk of HPV infection. [40]

Strengths and Limitations of the Study

This study has several methodological and contextual strengths. First, the use of a multistage sampling technique enhanced the representativeness of the study population within the selected tertiary health facility, thereby reducing selection bias. Second, the inclusion of both HIV-positive and HIV-negative women allowed for meaningful comparison and strengthened the internal validity of the findings regarding the association between HIV status and abnormal cervical cytology. Third, the application of both bivariate and multivariate logistic regression analyses enabled the identification of independent predictors of abnormal cervical cytology while controlling for potential confounders, thereby enhancing the internal validity of the findings and improving the robustness of the conclusions.

Additionally, the study utilized standardized data collection procedures and clearly defined outcome measures (abnormal cervical cytology), which enhances reproducibility. Also, the use of objective clinical outcomes (cervical cytology results) rather than solely self-reported measures reduced the risk of outcome misclassification. The refined multivariate model demonstrated good fit and moderate explanatory power,

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further supporting the reliability of the analytical approach.

Despite these strengths, some limitations of this study should be noted. The cross-sectional design limits the ability to establish causal relationships between identified predictors and abnormal cervical cytology. Temporal relationships, particularly between HIV infection, parity, and cytological abnormalities, cannot be definitively determined and should be interpreted cautiously. The study relied partly on self-reported data for behavioural and reproductive variables, which may be subject to recall bias and social desirability bias, particularly for sensitive variables such as age at sexual debut and number of sexual partners.

Furthermore, important clinical variables such as CD4 cell count, viral load, duration of HIV infection, and antiretroviral therapy (ART) status were not included in the analysis. These factors are known to influence the progression of cervical lesions among women living with HIV and may account for differences observed across studies. The study was conducted in a selected tertiary health facility in Lagos State, which may limit the generalizability of the findings to other regions with different sociodemographic or healthcare characteristics. Additionally, some variables initially included in the model (e.g., tribe) demonstrated instability due to sparse data and were excluded, which may have resulted in residual confounding. Finally, the absence of longitudinal follow-up precludes assessment of progression from low-grade to high-grade lesions. Despite these limitations, the study contributes context-specific evidence from a high-burden setting, which is critical for informing cervical cancer control strategies in Nigeria and similar low- and middle-income countries.

Implications for Policy, Practice, and Research

Policy Implications

The findings of this study have important implications for public health policy. The strong association between HIV infection and abnormal cervical cytology underscores the need for full integration of cervical cancer screening into HIV care programs. National and subnational health policies should prioritize routine and periodic screening for women living with HIV, in line with global recommendations for differentiated screening intervals in high-risk populations for effective cervical cancer elimination.

Furthermore, policies should also emphasize risk-based screening approaches. The identification of high parity as an independent risk factor suggests that reproductive health policies should incorporate targeted cervical cancer screening for multiparous women. Strengthening national cervical cancer control programs through the scale-up of HPV vaccination, screening (e.g., HPV DNA testing), and treatment of precancerous lesions remains essential.

Practice Implications

From a clinical and programmatic perspective, the findings highlight the need for a risk-based screening approach as well as targeted screening and early detection strategies. Healthcare providers should prioritize cervical cancer screening for HIV-positive women and women with high parity during routine clinical encounters and ensure timely referral and follow-up care. Continuous training and capacity-building of healthcare workers on cervical cancer prevention and screening guidelines are critical.

Integration of cervical cancer screening into routine maternal, reproductive, and HIV services can improve access and uptake. In addition, strengthening referral systems and follow-up care for women with abnormal cytology is essential to prevent progression to invasive disease.

Health education interventions should also emphasize the importance of early sexual health awareness and HPV prevention strategies, given the observed association between early sexual initiation and abnormal cytology.

Research Implications

Further research is needed to address the limitations identified in this study. Future research should adopt longitudinal or cohort study designs to elucidate and establish causal relationships between HIV infection, reproductive factors, and cervical cytological abnormalities. There is also a need to incorporate immunological and clinical parameters such as CD4 count, viral load, duration of HIV infection, and ART adherence to understand the role of immunosuppression in cervical disease progression and to provide a more comprehensive understanding of disease dynamics.

Further studies should explore the role of HPV genotypes, behavioural risk factors, and socio-cultural determinants in influencing cervical cancer risk. Additionally, large-scale, multi-centre studies across different regions of Nigeria would enhance the

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generalizability of findings. Operational research is also warranted to evaluate the effectiveness of integrated screening models and innovative approaches, such as self-sampling and point-of-care HPV testing, in improving screening uptake.

Conclusion

The prevalence of abnormal cervical cytology was statistically significantly higher among HIV-positive women than HIV-negative women. Atypical cervical smears as well as low-grade and high-grade squamous intraepithelial lesions were found among HIV-positive women, while only atypical cervical smears were found among HIV-negative women in this study

After adjusting for confounders, HIV status and high parity remained significant predictors of abnormal cervical cytology. This study reinforces the role of HIV infection and high parity as key determinants of abnormal cervical cytology. These findings highlight the need for targeted screening strategies focusing on HIV-positive women and those with high parity. There is a need to increase the awareness and advise women, especially HIV-positive women with a higher risk, about cervical cancer screening to reduce the morbidity and mortality arising from this disease. Women living with HIV require an enhanced screening protocol for cervical cancer to ensure that pre-invasive lesions are found early and treated. The findings support the prioritization of high-risk populations in cervical cancer prevention strategies and highlight the need for integrated, accessible, and context-specific screening interventions. Strengthening policy frameworks, improving healthcare delivery systems, and advancing research efforts are essential to reducing the burden of cervical cancer in Nigeria and similar settings.

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