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Comparative Prevalence and Predictors of Abnormal Cervical Cytology among HIV-Positive and HIV-Negative Postpartum Women in a Tertiary Hospital in Nigeria

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ABSTRACT

Background: *Cervical cancer remains a leading cause of cancer-related mortality among Nigerian women, with HIV-positive women bearing a disproportionate burden. The postpartum period offers a unique opportunity for targeted screening interventions. This study, a follow-up to an earlier work on awareness, aimed to compare the prevalence, patterns, and predictors of abnormal cervical cytology among HIV-positive and HIV-negative women attending postnatal care.*

Methods: *A cross-sectional study was conducted among 104 women (52 HIV-positive, 52 HIV-negative matched for parity) attending the 6-week postnatal clinic at Federal Medical Centre, Yenagoa, Nigeria, between June and October 2018. Cervical smears were obtained using conventional Papanicolaou staining and reported using the 2014 Bethesda system. Data were analyzed using SPSS version 22, with logistic regression to identify predictors of epithelial cell abnormality. Statistical significance was set at $p < 0.05$.*

Results: *Of 102 satisfactory smears analyzed (51 per group), the overall prevalence of abnormal cervical cytology was 26.5%. HIV-positive women demonstrated significantly higher prevalence (35.3%) compared to HIV-negative women (17.6%) (OR = 2.55; 95%CI: 1.01–6.39; p = 0.043). Among HIV-positive women, abnormalities included ASCUS (15.7%), LSIL (15.7%), and HSIL (3.9%). Independent predictors of abnormal cytology were age 30–39 years (OR = 18.81; p = 0.006), age 40–49 years (OR = 45.35; p = 0.034), history of sexually transmitted infection (OR = 7.89; p = 0.012), and multiple lifetime sexual partners (OR = 8.64; p = 0.037).*

Conclusion: *The prevalence of abnormal cervical cytology among postpartum women in this region is alarmingly high, particularly among HIV-positive women who bear twice the burden of their HIV-negative counterparts. These findings, viewed alongside the profound knowledge gaps and negligible screening uptake reported previously, underscore the urgent need for integrating cervical cancer screening into routine postnatal care services in Nigeria.*

Keywords

Cervical cancer screening, Cervical cytology, HIV, Nigeria, Pap smear, Postpartum.

Introduction

Cervical cancer remains a leading cause of cancer-related morbidity and mortality among women worldwide. According to GLOBOCAN 2022 estimates, there were approximately 660,000

new cases and 350,000 deaths from cervical cancer globally, with the highest burden concentrated in sub-Saharan Africa [1]. In Nigeria, the burden is particularly severe, with an estimated 13,676 new cases and 7,093 deaths recorded in 2022 alone. Cervical cancer is the third most common cancer overall in Nigeria and the second most common cancer among women, accounting for 10.7% of all new cancer cases in the country [2]. Approximately 60.9 million Nigerian women aged 15 years and older are at risk of developing the disease [3].

The disease follows a well-established progression from cervical intraepithelial neoplasia (CIN) to invasive cancer over 10-15 years, making it ideally suited for screening-based prevention [4]. More than 99.7% of cervical cancers are attributable to persistent infection with high-risk human papillomavirus (HPV), with HPV16 and HPV18 accounting for approximately 70% of cases globally [5]. In Nigeria, 66.9% of invasive cervical cancers are attributed to high-risk HPV types 16 or 18 [3].

HIV infection profoundly alters the natural history of cervical disease. Women living with HIV (WLHIV) face a 5- to 8-fold increased risk of invasive cervical cancer, with lesions that are more likely to be multifocal, higher-grade, and resistant to standard treatment [6]. Consequently, invasive cervical cancer is classified as an AIDS-defining condition [7].

Nigeria bears the second-highest HIV burden globally, with an estimated 3.4 million persons living with HIV [8]. Bayelsa State, where this study was conducted, has historically been classified among Nigeria's highest HIV-burden states, with prevalence reaching 9.1% in 2010 [9]. Despite this convergence of high HIV prevalence and cervical cancer risk, Nigeria lacks an organized national cervical screening programme, leaving screening opportunistic and largely inaccessible [10]. Recent data indicate that screening coverage remains abysmally low, with only 11% of Nigerian women ever having been screened [11], and no official national screening recommendation exists [3].

The 6-week postnatal clinic represents a strategic opportunity for screening, as women are already engaged with the health system following antenatal care [12]. We previously reported profound knowledge deficits in this same population, with only 39.2% aware of cervical cancer, 17.3% knowledgeable about screening, and merely 1.0% ever screened [13].

This study, a direct follow-up to our earlier work, aimed to: (1) determine and compare the prevalence of abnormal cervical cytology among HIV-positive and HIV-negative women attending postnatal care; (2) describe the patterns of cytological abnormalities; and (3) identify independent predictors of epithelial cell abnormality in this population.

Materials and Methods

Study Design and Setting

This cross-sectional study was conducted at the postnatal clinic of Federal Medical Centre (FMC), Yenagoa, Nigeria, between June and October 2018. The hospital serves patients primarily from Bayelsa, Rivers, and Delta States—areas disproportionately affected by HIV/AIDS.

Study Population

Eligible participants were women aged ≥18 years attending their 6-week postnatal visit. Exclusion criteria included: prior history of abnormal cervical cytology, previous or current management for cervical cancer, or persistent lochia.

Sample Size and Sampling

Sample size was calculated based on a reported 3% prevalence of abnormal cervical cytology from the postnatal clinic of the University of Calabar Teaching Hospital (14), yielding a minimum of 45 per group. Accounting for 15% attrition, 52 participants were recruited per group. HIV-positive women were consecutively enrolled and matched with HIV-negative women for parity.

Data Collection

Following pretest counselling, a structured interviewer-administered questionnaire collected socio-demographic data, risk factor history, and information on awareness (previously reported [13]).

Cervical Sample Collection and Processing

Cervical smears were collected using an Ayre's spatula and cytobrush. Samples were stained using the modified Papanicolaou method [15] and reported by two independent pathologists blinded to HIV status, using the 2014 Bethesda system [16].

Ethical Considerations

Ethical approval was obtained from the FMC Yenagoa Health Research Ethics Committee. All participants provided written informed consent.

Statistical Analysis

Data were analyzed using SPSS version 22. Chi-square test and odds ratios with 95% confidence intervals compared groups. Binary logistic regression (bivariate and multivariate) identified independent predictors of abnormal cytology. Statistical significance was set at $p < 0.05$.

Results

Participant Characteristics

A total of 102 satisfactory smears were analyzed (51 per group). The mean age was 31.12 ± 4.46 years, with no significant difference between groups ($p = 0.931$). Most participants were married (97.1%), in monogamous unions (98.0%), and had at least secondary education (94.1%).

Prevalence of Abnormal Cervical Cytology

Overall, 27 women (26.5%) had abnormal cervical cytology (Table 1). HIV-positive women demonstrated significantly higher prevalence (18/51, 35.3%) compared to HIV-negative women (9/51, 17.6%) ($\chi^2 = 4.08$; $p = 0.043$). HIV-positive women were 2.55 times more likely to have abnormal cytology (OR = 2.55; 95%CI: 1.01--6.39).

Table 1: Prevalence of Abnormal Cervical Cytology by HIV Status.

Cytology Result	HIV+ (n=51)	HIV- (n=51)	Total (N=102)	χ^2	p-value	OR (95%CI)
Normal (NILM)	33 (64.7%)	42 (82.4%)	75 (73.5%)			
Abnormal	**18 (35.3%)**	**9 (17.6%)**	**27 (26.5%)**	**4.08**	**0.043**	**2.55 (1.01–6.39)**

Patterns of Abnormal Cytology

Among HIV-positive women, abnormalities included ASCUS (15.7%), LSIL (15.7%), and HSIL (3.9%) (Table 2). While HIV-positive women demonstrated higher proportions of each abnormality type, these differences did not achieve statistical significance.

Table 2: Pattern of Abnormal Cervical Cytology by HIV Status.

Bethesda Classification	HIV+ (n=51)	HIV- (n=51)	Total (N=102)	p-value
NILM	33 (64.7%)	42 (82.4%)	75 (73.5%)	
ASCUS	8 (15.7%)	3 (5.9%)	11 (10.8%)	0.110
LSIL	8 (15.7%)	5 (9.8%)	13 (12.8%)	0.373
HSIL	2 (3.9%)	1 (2.0%)	3 (2.9%)	0.558

Factors Associated with Abnormal Cytology

Bivariate analysis revealed significant associations between abnormal cytology and age 30--39 years, multiparity, HIV-positive status, prior STI, and multiple sexual partners (Table 3).

Table 3: Factors Associated with Cervical Epithelial Cell Abnormality (Bivariate Analysis).

Risk Factor	Total N (%)	Normal n (%)	Abnormal n (%)	χ^2	p-value
Age (years)				**13.28**	**0.001**
< 30	37 (36.3)	35 (46.7)	2 (7.4)		
30–39	62 (60.8)	38 (50.7)	24 (88.9)		
40–49	3 (2.9)	2 (2.7)	1 (3.7)		
HIV Status				**4.08**	**0.043**
Negative	51 (50.0)	42 (56.0)	9 (33.3)		
Positive	51 (50.0)	33 (44.0)	18 (66.7)		
Prior STI				**11.29**	**0.001**
No	90 (88.2)	71 (94.7)	19 (70.4)		
Yes	12 (11.8)	4 (5.3)	8 (29.6)		
No. of sexual partners				**5.89**	**0.015**
1	20 (19.6)	19 (25.3)	1 (3.7)		
≥2	82 (80.4)	56 (74.7)	26 (96.3)		

Multivariate logistic regression identified independent predictors of abnormal cytology (Table 4). HIV status did not retain independent significance after adjusting for confounders.

Table 4: Multivariate Logistic Regression Analysis.

Variable	Adjusted OR	95% CI	p-value
Age (years)			
<30	1.00 (ref)		
30–39	18.81	2.33–151.50	**0.006**
40–49	45.35	1.33–154.09	**0.034**
Prior STI	7.89	1.58–39.51	**0.012**
Multiple sexual partners	8.64	1.79–94.13	**0.037**

Discussion

Overview of Key Findings

This study provides critical epidemiological data on the comparative burden of cervical cytological abnormalities among HIV-positive and HIV-negative postpartum women in the Niger Delta region. The overall prevalence of 26.5% is alarmingly high—nearly tenfold higher than the 2.6–3% previously reported among Nigerian postnatal populations [14,17]. This dramatic elevation likely reflects the convergence of high HIV prevalence, shared behavioural risk factors, and the complete absence of systematic screening in this region.

Global estimates from GLOBOCAN 2022 confirm that cervical cancer incidence rates vary at least 10-fold across world regions, with the highest rates in sub-Saharan Africa [1]. In Nigeria, the magnitude of the problem is stark: with approximately 60.9 million women aged 15 years and older at risk, the country records an estimated 12,075 to 13,676 new cervical cancer cases and 7,093 to 7,968 deaths annually [2,3]. The age-standardized incidence rate of 18.4–26.2 per 100,000 women and mortality rate of 13.2 per 100,000 women rank among the highest globally [3,11]. Without urgent intervention, modelling projections suggest that over 7.1 million Nigerian women could die from cervical cancer by 2120 [11].

Goddard and colleagues' analysis of cancer deaths averted in the United States from 1975 to 2020 estimated that approximately 160,000 cervical cancer deaths were averted through screening, demonstrating that cervical cancer is nearly entirely preventable through organized programmes [18]. The contrast with our setting—where screening uptake is 1%—could not be starker. Recent studies from Eastern Nigeria confirm that even when women present with invasive cervical cancer, none have undergone prior screening [19], underscoring the complete failure of secondary prevention in the region.

HIV and Cervical Dysplasia

The finding that HIV-positive women bear twice the burden of their HIV-negative counterparts (35.3% vs. 17.6%; OR = 2.55) aligns with the known biology of HIV-HPV co-infection, where immunosuppression promotes HPV persistence and accelerated progression to dysplasia (6). This prevalence is consistent with reports from other Nigerian centres (22.6–76.1%) [20,21] and South Africa (54.9%) [22].

Interestingly, while HIV status was significant in bivariate analysis, it did not retain independent significance in multivariate modelling. This finding has several possible explanations. First, the elevated risk among HIV-positive women may be largely mediated through behavioural factors—specifically, multiple sexual partners and a history of STIs. Second, our sample comprised relatively healthy HIV-positive women with preserved immune function (CD4

>800 cells/mm³) and universal HAART coverage. Studies have consistently shown that cervical dysplasia risk correlates with the degree of immunosuppression, with the highest risk among women with CD4 <200 cells/mm³ [23]. Among women with well-controlled HIV on effective HAART, the excess risk may be substantially attenuated [24].

These findings do not diminish the importance of HIV as a risk factor. Rather, they suggest that the mechanisms are complex and mediated through both direct immunosuppressive effects and shared behavioural determinants. The WHO continues to recommend intensified screening for WLHIV, including initiation at age 25 and 3--5 yearly intervals, based on robust evidence of elevated risk [25].

Independent Predictors

Advancing age emerged as the strongest independent predictor, with women aged 40--49 years demonstrating 45-fold increased odds compared to those under 30. This aligns with global epidemiology showing peak incidence of high-grade lesions in the fourth and fifth decades [26] and supports WHO recommendations for age-targeted screening [25]. The age effect likely reflects cumulative HPV exposure, persistent infections that have not cleared, and age-related changes in cervical epithelium and immune surveillance.

History of STI (OR = 7.89) and multiple sexual partners (OR = 8.64) reflect increased probability of exposure to high-risk HPV and other oncogenic co-factors [5]. These findings underscore the importance of sexual history assessment in risk stratification and the need for comprehensive sexual health education.

Patterns of Abnormalities

The predominance of low-grade lesions (ASCUS and LSIL) in both groups is consistent with the natural history of HPV infection in reproductive-age women, where most infections are transient [27]. The higher proportion of HSIL among HIV-positive women (3.9% vs. 2.0%), though not statistically significant, aligns with the recognized tendency for HIV-associated lesions to be more severe and progressive [6].

The 15.7% prevalence of ASCUS among HIV-positive women warrants particular attention, as ASCUS more frequently harbours underlying high-grade disease in immunocompromised populations and requires careful follow-up [28].

Integration with Previous Findings

This study is a direct follow-up to our earlier publication, which documented profound knowledge deficits in this same population: only 39.2% were aware of cervical cancer, 17.3% knew about screening, and merely 1.0% had ever undergone screening [13]. Taken together, these two papers tell a complete and troubling story: the women at highest risk are those least likely to know about the disease or have access to screening. This represents a critical failure of current prevention efforts and a missed opportunity, given that all participants had recently completed antenatal care—a period of intensive health education and healthcare contact.

Implications for Policy and Practice

These findings have immediate implications for cervical cancer prevention in Nigeria and similar low-resource, high-HIV-burden settings:

First, integration into postnatal care. The 6-week postnatal visit represents an ideal "opportunistic yet systematic" screening platform [12]. Women are already engaged with the health system and—for HIV-positive women—already linked to chronic care services. Coleridge and colleagues demonstrated that quality improvement projects targeting this period can significantly improve screening uptake [29].

Second, task-shifting and simplified screening. Given the limited number of cytopathologists in Nigeria, alternative approaches, including visual inspection with acetic acid (VIA) and HPV DNA testing on self-collected samples, should be considered. The WHO 2021 guideline recommends HPV DNA testing as the primary screening method, with options for self-sampling [25]. Self-sampling has been shown to increase screening uptake among under-screened women in low-resource settings [30]. The WHO 90-70-90 elimination strategy explicitly calls for 70% of women to be screened with a high-performance test by age 35 and again by 45 [11].

Third, targeted approaches for HIV-positive women. The twofold higher prevalence supports WHO recommendations for more frequent screening in this population [25]. Integration of cervical cancer screening into HIV care programmes–including PMTCT and antiretroviral therapy clinics–could substantially increase coverage among this high-risk group.

Fourth, health worker training. Our earlier finding that less than half of aware women learned about cervical cancer from health workers [13] indicates an urgent need for training providers to routinely offer screening. Studies from sub-Saharan Africa have shown that trained nurses and midwives can perform cervical screening competently [31]. Health workers remain the primary source of information for many women [32], positioning them as critical agents for behaviour change.

Fifth, national screening policy. Without concerted action to establish an organized (and funded) national programme, efforts to reduce cervical cancer incidence will remain insignificant [10]. The WHO Cervical Cancer Elimination Initiative has set 90-70-90 targets for 2030, and achieving these in Nigeria will require political will and sustained investment [33]. Encouragingly, modelling demonstrates that if Nigeria rapidly scales up the three pillars from 2024 and meets these targets by 2030, cervical cancer could be eliminated as a public health problem (fewer than 4 new cases per 100,000 women) by 2087, saving over 6.3 million lives by 2120. The economic argument is equally compelling: for every US dollar invested, an estimated US $42.85 would be returned to the economy over 30 years through increased women's workforce participation [11].

Recent evidence from Eastern Nigeria suggests that with sustained prevention efforts, the pattern of gynaecological cancers may be shifting, with some centres now reporting ovarian cancer as the most prevalent malignancy [34]. This trend–attributed to increased

awareness, sustained screening, and treatment of pre-malignant lesions–demonstrates that change is possible. However, cervical cancer remains the leading gynaecological malignancy in most Nigerian centres, accounting for 41-49.3% of cases [19,35]. The persistent challenges of late presentation (75.4% diagnosed at Stages III-IV) and absence of local radiotherapy services [19] demand urgent health system strengthening, including investment in oncology infrastructure and pathology services [11].

Strengths and Limitations

Strengths include being about the first study to compare cervical cytology abnormalities by HIV status specifically in the postpartum population of Nigeria's Niger Delta region, matching for parity, and using standardized Bethesda reporting with blinding.

Limitations include the hospital-based design limiting generalizability, a relatively small sample size for subgroup analyses, and the absence of HPV DNA testing. Additionally, all HIV-positive participants had preserved immune function (CD4 >800 cells/mm³); findings may not apply to women with advanced immunosuppression.

Conclusion

The prevalence of abnormal cervical cytology among postpartum women in the Niger Delta region of Nigeria is alarmingly high, with HIV-positive women bearing twice the burden of their HIV-negative counterparts. Advancing age, history of STI, and multiple sexual partners are independent predictors of disease. These epidemiological findings, viewed alongside the profound awareness deficits and negligible screening uptake we previously reported [13], expose a critical failure of current prevention efforts.

Integrating cervical cancer screening into routine postnatal care---leveraging an existing platform where women are already engaged with the health system---offers a pragmatic, scalable strategy to address this crisis. As Goddard and colleagues demonstrated, screening has averted hundreds of thousands of cervical cancer deaths in high-income countries [18]. The same is possible in Nigeria with political will, health system strengthening, and sustained investment. Failure to act will ensure that cervical cancer remains not only a preventable tragedy but a persisting reality for generations of Nigerian women.

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Authors' Contributions

OSO conceptualized and designed the study, managed literature searches, participated in data collation and wrote the first draft of the manuscript. PWO and AI modified the study protocol and supervised the entire research. MS participated in literature searches and wrote the results. PWA participated in literature searches and writing of the results. AAD participated in literature searches and analysis of data. All authors read and approved the final manuscript.

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