

Epidemiological and Cytopathological Profile of Squamous Intraepithelial Lesions of the Cervix in Patients with HIV/AIDS in the Context of Armed Conflict in Eastern Democratic Republic of Congo (DRC)

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Abstract

Background: Intraepithelial lesions of the cervix are the most common precursor of cervical cancer, and in HIV-affected patients, low immunity is associated with the occurrence of these lesions, but few studies have been carried out in the war-affected areas of eastern DR Congo to detect these lesions in rape victims and those exposed to armed confrontation. **Objective:** This study aimed to describe the epidemiological profile of squamous intraepithelial lesions of the cervix in HIV-positive patients, rape victims, and those exposed to armed confrontation. **Methods:** This descriptive and analytical cross-sectional study was conducted at the Panzi General Reference Hospital in eastern Democratic Republic of the Congo (DRC), after analyzing cervical smears from patients infected with HIV who had been victims of rape or exposed to armed group clashes. Data analysis was performed using SPSS Statistics 26 software. **Results:** In this study, 103 HIV-positive patients were identified and screened. Thirty-seven were victims of rape and exposed to armed conflict, and 66 were exposed to armed conflict. Of these 103 patients,

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56 underwent Pap smears, and 14 had precancerous cervical lesions. The mean age was 41 ± 10.3 years, with patients from urban areas accounting for 74.8% of cases. The number of former sexual partners was associated with the occurrence of precancerous lesions observed on cervical smears ($p = 0.029$, OR [0.020; 0.357]), as was the level of education ($p = 0.036$, [0.015; 0.442]; IC95%). No pregnancy constituted an increased risk of high-grade precancerous cervical lesions (ASC-H) ($p < 0.05$; ORa to 3977917.8 IC95% [225149.6 to 70281411.9], IC95%). Atypical Squamous Cells of Undetermined Significance (ASC-US) and low-grade squamous intraepithelial lesions (LSIL) predominated in these patients. **Conclusion:** This study suggests that precancerous lesions of the cervix in patients with HIV/AIDS who are victims of atrocities in eastern DRC remain underdiagnosed, suggesting that mass screening of all HIV-positive women remains a priority. Low-grade precancerous lesions of the cervix dominate cytopathological examinations in this context.

Keywords

HIV-Positive, East of DR Congo, Squamous Intraepithelial Lesions, Precancerous Cervical Lesions, AIDS

1. Introduction

Cervical cancer ranks as the second most prevalent cancer among women globally [1]. It is the primary cause of cancer-related deaths in women from developing nations, exhibiting the highest incidence and mortality rates among the world's most impoverished populations [2] [3]. The link between HIV infection and cancer is becoming more common, as HIV-positive patients on triple antiretroviral therapy experience longer life expectancies [4].

Cervical cancer lends itself particularly well to screening, with the means to carry out diagnostic tests to identify precursors of the disease at an early stage, and simple outpatient procedures to treat precursor lesions (cervical intraepithelial neoplasia [CIN]) available with a high success rate [1]. However, fewer women living with acquired immunodeficiency syndrome (AIDS) undergo screening in resource-limited countries, making this cancer underdiagnosed in this population.

In almost 50% of cases, low-grade cervical lesions regress in less than 2 years. If they persist, they may progress to high-grade lesions within 2 or 3 years, which in turn may regress or, within ten years or so, become invasive cancer. As we can see, the evolution is generally slow, and cancer does not occur until the age of 40, even though HPV infection occurred within 2 years of first intercourse [3].

The cytopathological lesions most frequently found on smears can present various appearances, including regular smears, inflammatory smears, smears with atypical squamous cells of undetermined significance (ASC-US), low-grade squamous intraepithelial lesions (LSIL), and high-grade squamous intraepithelial le-

sions (HSIL) [5].

An increase in the number of cancers associated with Acquired Immunodeficiency Syndrome (AIDS), notably cervical cancer, Kaposi's sarcoma, and non-Hodgkin lymphoma, along with non-AIDS-defining cancers, which also become more prevalent with age. HIV-positive individuals are more likely to develop a wide variety of cancers than the general population, particularly those linked to human papillomavirus (HPV) [6].

Unprotected sexual intercourse is one of the factors that cause various viruses to develop, leading to initial lesions of the cervix [7] [8], rape is thus used as a weapon of war against all those women who are exposed to atrocities in the east of the Democratic Republic of Congo [9].

In the east of the Democratic Republic of Congo (DRC), cancer registries exist but are not operational [5], and especially do not include rape victims with precancerous lesions. As a result, little is known about screening for cancerous or precancerous cervical lesions among this category of HIV-positive women who are victims of atrocities.

The earlier research on co-infection of HIV and HPV recommended a nationwide cervical cancer early detection policy for all individuals with HIV/AIDS [5] [10]. Various strategies could effectively identify the sociodemographic factors for women at risk.

This cross-sectional study aims to investigate the epidemiological and cytopathological profiles of squamous intraepithelial lesions of the cervix in patients infected with HIV/AIDS who were victims of atrocities during the armed conflicts in the east of the Democratic Republic of Congo.

2. Methodology

2.1. Study Design

This is a descriptive and analytical cross-sectional study of HIV-infected patients admitted after being victims of either rape or atrocities committed by armed groups in the eastern Democratic Republic of Congo, admitted to the Panzi General Reference Hospital (South Kivu, Democratic Republic of Congo) between May 1, 2024, and June 28, 2025.

2.2. Parameters

The research was conducted at Panzi General Reference Hospital. This tertiary and university-affiliated facility provides holistic care to women who are victims of atrocities, as well as treating HIV infections and gynecological conditions within the Department of Gynecology, Obstetrics, and Infectious Diseases. This study included patients who had tested or were known to be positive for HIV infection but had been exposed to the atrocities of armed conflict. This enabled epidemiological and cytopathological data to be collected. The analysis was carried out in the laboratory of the Panzi General Reference Hospital and evaluated by

two specialist pathologists.

2.3. Participants

This cross-sectional study included all HIV-positive patients (Unigold and determined tests) receiving outpatient or inpatient care at the Panzi General Reference Hospital, within the infectious diseases department of the internal medicine department and the gynecology-obstetrics department for the follow-up of rape victims. These patients had undergone a cervical smear in gynecology, regardless of the stage of their disease. Convenience sampling was performed. The sample was taken from the cervix by a doctor specializing in gynecology. Patients were examined, and samples were taken by a gynecology resident.

In this study, 103 patients were recruited, but only 56 patients obtained results from their cytopathological tests. However, due to stigma, discomfort, and fear, 47 patients refused to undergo cervical cytology sampling.

The samples were taken directly to the laboratory by a qualified laboratory technician, in accordance with ethical standards. Pregnant patients were excluded from the study.

2.4. Variables

Independent sociodemographic variables were examined, and their proportions were articulated as percentages. These variables include: age, the number of previous sexual partners, the number of current sexual partners, the age at first pregnancy, the age at first sexual intercourse, the age of menarche, the duration of HIV infection, socioeconomic status (determined by salary in dollars), parity, occupation, living environment, marital status, educational attainment, religion, contraception methods, and the duration of HIV/AIDS disease.

The dependent variables involved the cervico-uterine smear outcomes of HIV-positive patients who consented to participate in the study. The cytopathological findings that made up our dependent variables included normal smear, inflammatory smear, atypical squamous cells of undetermined significance (ASC-US), low-grade squamous intraepithelial lesion (LSIL), and high-grade squamous intraepithelial lesion (HSIL). These findings were classified into two categories: atypical, low-grade, and high-grade squamous intraepithelial lesions, which are regarded as precancerous (pathological) lesions, and normal lesions.

2.5. Sample and Cytopathological Examination

Samples were taken by trained and qualified gynecology residents, accompanied by a laboratory technician also trained in sampling. Sample transport complied with Clinical and Laboratory Standards Institute (CLSI) guidelines [11] [12]. The smear was taken at the Panzi general referral hospital and described the various cytological aspects of cervical lesions. To limit the risk of bias in the interpretation of cytopathological results, the results were analyzed and interpreted by two specialists in anatomopathology, one of whom was a professor.

2.6. Sample Size

Sampling was by convenience, and participants who gave their consent were allowed to participate in the study.

Biais:

In order to avoid selection bias and enable readers to interpret the results correctly, we performed linear and logistic regressions, excluding any incomplete observations.

2.7. Statical Analysis

Data collection was conducted via Kobocollect with a predefined and refined form, filled out by a medical specialist skilled in using the software. The data were cleaned in Microsoft Excel 2019 and analyzed with SPSS 26. Both descriptive statistics and linear regression analyses were carried out. To minimize bias, multinomial logistic regression was employed. The significance level was set at a p-value of 0.05.

2.8. Ethics

Confidentiality and anonymity of patients and their information were preserved. Informed consent was obtained from each patient before any information was collected. The scientific committee of the Université Évangélique en Afrique (UEA) had granted authorization for the research, and the provincial ethics committee registered under the number CNES 001/DPSK/224PP/2025.

3. Results

Frequency

In this study, 103 patients infected with HIV (human immunodeficiency virus) were recruited. All of these women had been exposed to armed conflict and its atrocities, but 37 of them had also been victims of rape. Due to stigma, discomfort, and fear, 47 patients refused to undergo cervical cytology sampling. Cytopathological tests were performed on cervical samples taken from 56 patients, revealing 14 cases of precancerous lesions. The description of sociodemographic factors in **Table 1**, and the averages of quantitative variables, showed that the mean age of the patients was 41 ± 10.3 years. **Table 1** suggests that patients from urban areas were predominantly represented, *i.e.*, 74.8% of cases.

Table 1. Sociodemographic data.

Age	N = 103	%
20 - 30	17	16.5
31- 40	37	35.9
40 -50	28	27.2
>50	21	20.4
Age at 1st sexual intercourse (year)		
10 - 20	88	85.4

Continued

21 - 30	15	14.6
Age 1st pregnancy (year)		
None	5	4.9
10 - 20	75	72.8
21 - 30	20	19.4
>30	3	2.9
Number of former sexual partners		
1 - 5	91	88.3
6 - 10	8	7.8
>10	4	3.9
Number of current sexual partners		
1 - 3	99	96.1
4 - 6	2	1.9
>6	2	1.9
HIV duration (Year)		
1 - 5	37	35.9
6 - 10	26	25.2
>10	40	38.8
Duration of HIV treatment (Year) (n = 91)		
1 - 5	41	45.1
6 - 10	20	22.0
>10	30	33.0
Variables	N	%
Living environment		
Urban	77	74.8
Rural	26	25.2
Marital status		
Widowed	43	41.7
Married	38	36.9
Divorced	18	17.5
Single	4	3.9
Education level		
None	20	19.4
Primary	24	23.3
Secondary	51	49.5
University	8	7.8
Profession		
Housekeeper	52	50.5
Shopkeeper	25	24.3
Farmer	15	14.6
Government official	6	5.8
Dressmaker	5	4.9
Contraception		
No	85	82.5
Yes	18	17.5

The most common age range was between 31 and 40 (35.9%). The age of first sexual intercourse and first pregnancy among patients was between 10 and 20 years (85.4%) and 10 to 20 years in 72.8% of cases, respectively. 88.3% of patients

had between 1 and 5 previous sexual partners; however, 96.1% of them currently have between 1 and 3 sexual partners. HIV infection was present in 38.8% of patients more than 10 years ago, and 45.1% of these patients were on antiretroviral treatment within 1 to 5 years.

Table 1 shows that widows accounted for 41.7%, with the predominant level of education being secondary school. However, 50.5% of these patients were housewives.

Protestants made up 64.1% of the cases. Contraception was used by 17% of the study participants, with depot contraception accounting for 38.9% of occurrences.

Table 2. Distribution of means for quantitative variables of sociodemographic factors.

Variables	Mean	SD	Min	Max	Median	Mode
Age	41.0	10.3	23.0	65.0	40.0	35.0
Number of former sexual partners	2.1	2.3	1.0	20.0	1.0	1.0
Number of current sexual partners	0.6	0.6	0.0	3.0	1.0	1.0
Age at 1st pregnancy	18.6	4.3	0.0	36.0	18.0	16.0
Age at 1st sexual intercourse	17.5	2.6	13.0	25.0	17.0	18.0
Age of menarche	14.0	1.6	10.0	18.0	14.0	13.0
HIV duration Year	9.1	6.3	1.0	24.0	8.0	1.0
Viral load	52619.0	374234.3	0.0	3240000.0	0.0	0.0
Socioeconomic level in dollars	27.9	53.9	0.0	400.0	10.0	0.0
Parity	5.0	2.7	0.0	14.0	5.0	4.0
Duration of anti-HIV treatment	8.3	6.1	1.0	24.0	7.5	1.0

SD: standard deviation; Min: minimum; Max: maximum; HIV: human immunodeficiency virus.

Table 2 shows that the average age of first pregnancy was 18.6 ± 4.3 years, and the average age of sexual intercourse was 17.5 ± 2.6 years. The average number of former partners was 2.05 ± 2.3 years. The average duration of HIV infection in our patients was 9.1 ± 6.3 years, with a viral load of 52619.0 ± 374234.3 copies/milliliter. This table also suggests that the average economic level of the patients was 27.9 ± 53.9 USD. The mean parity among patients in this study was 5 ± 2.7 . The mean duration of anti-viral (HIV) treatment was 8.3 ± 6.1 years.

Table 3. Distribution of proportions of cytopathological lesions.

Pathological findings	n = 56	%
Normal	41	73.2
ASC-US	7	12.5
LSIL	6	10.7
ASC-H	2	3.6

ASC-US: Atypical Squamous Cells of Undetermined Significance; LSIL: low-grade squamous intraepithelial lesions; ASC-H: high-grade Atypical Squamous Cells.

The precancerous lesions observed in this study were low-grade ASC-US (12.5%), low-grade squamous intraepithelial lesions (LSIL) (10.7%), and high-grade atypical squamous cells (ASC-H) (3.6%) (Table 3). Table 4 shows the association between cytopathological findings and sociodemographic factors.

Table 4. Linear regressions of sociodemographic factors and cytopathological findings.

Variables	t	p	OR (IC 95%)	
Age	0.513	0.612	-0.017	0.028
Age of menarche	-0.467	0.644	-0.176	0.110
Age at 1st sexual intercourse	1.009	0.321	-0.045	0.132
Age at 1st pregnancy	-1.207	0.238	-0.068	0.018
HIV duration Year	0.045	0.965	-0.100	0.105
Anti-HIV duration	-0.319	0.752	-0.125	0.092
Number of current sexual partners	-0.551	0.585	-0.353	0.202
Number of previous sexual partners	2.289	0.029	0.020	0.357
Living environment	-0.931	0.359	-0.602	0.225
Level of education	2.189	0.036	0.015	0.442
Profession	0.765	0.450	-0.089	0.196
Marital status	0.975	0.336	-0.031	0.087
Socioeconomic level	-0.138	0.891	-0.003	0.003
Religion	-1.063	0.296	-0.484	0.153
Parity	0.455	0.652	-0.064	0.101
Tobacco	-0.851	0.400	-1.527	0.624
Contraception	-0.479	0.635	-0.528	0.326
Type of sexual relations	-0.934	0.357	-0.562	0.208

There was a significant association between the presence of precancerous lesions on cervical smear and the number of former sexual partners ($p = 0.029$, OR [0.020; 0.357]; IC95%).

This table also suggests that there was no statistically significant association between most of the sociodemographic factors studied in HIV-infected women. However, the level of education ($p = 0.036$, [0.015; 0.442]; CI95%) significantly influenced the occurrence of precancerous lesions. Table 5 presents the logistic regression according to high or low grade lesions observed on cytopathological examination.

Table 5. Multinomial logistic regression of precancerous lesions and sociodemographic factors.

Variables		p	ORa	IC95%	
ASC-US at Frottis					
Age	20 – 30	0.999	314635156.5	0.0	. ^b
	31- 40	0.999	183761155.0	0.0	. ^b
	40 -50	1.000	14.7	0.0	. ^b
	>50	.	.	.	.

Continued

Age at 1st intercourse	10 -20	0.996	916059.0	0.0b	. ^b
	21 -30	.	.	.	.
Number of previous sexual partners	1 - 5	0.000	2.4E-16	8.8E-18	6.7E-15
	6 - 10	.	1.4E-15	1.4E-15	1.4E-15
	>10	.	.	.	.
Number of current sexual partners	1 - 3	1.000	5609454918510 833.0	0.0	. ^b
	4 - 6	1.000	1944556176.1	0.0	. ^b
	>6	.	.	.	.
HIV duration in years	1 - 5	0.995	882605.6	0.0	. ^b
	6 - 10	1.000	0.1	0.0	. ^b
	>10	.	.	.	.
Anti-HIV duration in years	1 - 5	0.994	2.4E-7	0.0	. ^b
	6 - 10	0.999	0.1	0.0	. ^b
	>10	.	.	.	.
ASC-H at Frottis					
	No pregnancy	0.000	3977917.8	225149.6	70281411.9
1st pregnancy age	10 - 20	.	12375744.4	12375744.4	12375744.4
	21 - 30	.	.	.	.
	>30	.	.	.	.

This study found that having fewer sexual partners protects against low-grade ASC-US lesions ($p < 0.05$; ORa at $2.4E-16$, 95% CI [$8.8E-18$ to $6.7E-15$]). The no-conception impact increases the probability of high-grade cervical precancerous lesions (ASC-H) ($p < 0.05$; ORa = 3977917.8 , 95% CI [225149.6 to 70281411.9]).

4. Discussion

In this study, the main results can be summarized by five points: (i) The frequency of cervical cancer screening among HIV-infected patients was found to be low. (ii) No cases of cervical cancer were detected in patients who underwent screening. (iii) However, precancerous lesions were more common in HIV-infected patients. (iv) Histological analysis showed a predominance of atypical squamous cells of undetermined significance (ASC-US) and low-grade squamous intraepithelial lesions (LSIL). (v) The incidence of precancerous cervical lesions decreased in patients with fewer previous sexual partners ($p = 0.029$, OR [0.020; 0.357], 95% CI). Additionally, a high level of education appeared to be protective ($p = 0.036$, OR [0.015; 0.442], 95% CI). High-grade lesions (ASC-H) were more likely to develop in no pregnancy ($p < 0.000$; OR 3977917.8 [225149.6 to 70281411.9] IC95%).

Several recent studies discuss cervical cancer linked to Human Papillomavirus (HPV) [13]-[15]. However, cervical cancer is the second most common cancer among women worldwide, with around 500,000 new cases per year and 250,000 deaths. Around 85% of these cases occur in developing countries where women do not have access to systematic screening, while in very high-income regions such as Europe, cervical cancer is only the seventh most deadly cancer in women,

with around 50,000 new cases a year and 22,000 deaths, and 175,000 are carriers (symptomatic or not) [1]. This would explain the low frequency of screening observed in this study. The country being classified as a low-resource country, cancer screening is not systematic; hence, the recommendation emanating from this observation would be to introduce the cervical smear as a routine examination in women living with HIV infection.

In this study, among the 14 cases with precancerous lesions, ASC-US was represented in 6 cases (10.7%), LSIL in 6 cases (10.7%), and ASC-H in 5 cases (8.9%). However, the study by Kasap B. *et al.* [15] found, in their study in Türkiye: A rate of 84.9% of normal cervical smears; 1.55% of ASC-US; 5.3% of LSIL and 4.0% of HSIL. Garbuglia AR *et al.* [16] obtained the following results in Italy: normal cervico-uterine smear in 76.4% of cases; ASC-US, LSIL, and HSIL in 24.4% of cases, while Corrêa CM *et al.* [17] obtained a normal cervico-uterine smear in 63.2% of cases in Brazil. Agaba AP *et al.* [18] in Nigeria, 31.7% of cervical smears were normal; 39.3% were ASC-US; 15.2% LSIL and 13.8% HSIL. We think that this difference in proportions can be explained by the low screening rates observed in our environments.

The cervico-uterine smear remains the most widely used tool for cervical cytopathology, due to its low cost and ease of use [5]. In the study by Nyakio *et al.* [5], the smear was normal in 82.9% of cases and inflammatory in 3.6%. Cytological abnormalities found in 13.5% of cases included 7.20% atypical cells (ASC-US), 4.50% low-grade lesions (LSIL), and 1.80% high-grade lesions (HSIL). However, HIV serology was negative in 52.1% of cases [5] of their study population, unlike our study, in which all patients were HIV-positive.

As a result, the proportions of cytopathological findings in this study were: normal in 73.2% of cases, pathological in 12.5% of ASC-US lesions, LSIL lesions in 10.7%, and ASC-H lesions in 3.6% of cases. These results suggest a tendency to observe low-grade precancerous lesions of the uterine cervix in women living with HIV infection, with no notion of previous conception, although the screening rate remains low.

The average age of patients in this study was 41 ± 10.3 years; this age corroborates the range reported in a study suggesting average ages of HIV-infected women ranging from 28 to 51.9 years, while the average age at first sexual intercourse varied from 16.7 to 18 years in the same study [19]. Similarly, in this study, the average age at first intercourse was 17.5 ± 2.6 years.

In a similar series of evaluations carried out in Cameroon, the authors reported that 69.4% of women had their first sexual intercourse before the age of 19 [20]. This was close to the results of Arora *et al.* [21], who found that the rate of first sexual intercourse was 50.6% of women before the age of 19. As for Shin SS *et al.* [22], they reported in India a rate of 51.4% of women having their first before the age of 17. This early age range is often reported in the literature, and we think it may be linked to the way of life in different countries, customs, and above all, the low socioeconomic level often observed in certain African countries.

Primary prevention of HPV includes HPV vaccination, smoking prevention, and sexual behavior (number of partners, sexually transmitted infections, condoms, and possibly the contraceptive pill) [13]. However, the primary prevention of HIV infection is still largely protected by sexual intercourse. On the other hand, screening for cancerous lesions of the cervix helps to anticipate the risk of cervical cancer. Such screenings are less frequent in women suffering from HIV infection and precancerous lesions of the cervix, in developing countries or those in armed conflict, as is the case in our context, meaning that diagnosis of cervical cancer in immunocompromised women remains underdiagnosed, due to less frequent hospital visits.

Risk of dysplasia is associated with several sexual partners and condom use [13]. In this study, the average number of former partners was 2.05 ± 2.3 , with a minimum of one partner and a maximum of 20. Shin SS *et al.* [22] also reported in India a rate of 77.3% of women with several sexual partners between 2 and 5; Jolly PE *et al.* [23], and Wudtisan J *et al.* [24] in Thailand and Hooi DJ *et al.* [25] in the Netherlands obtained rates of 66.7% and 69.9% of women having at least two sexual partners in their respective studies.

In the Ethiopian study, the authors reported that participation in cervical cancer screening was very low. Education level, parity, time since HIV diagnosis, and CD4 count are important predictors of cervical cancer screening [26]. The screening rate was also low in this study, and the level of education for most patients was high school. On the other hand, the time since diagnosis of seropositivity and CD4 count was not investigated in this study. However, the average parity among patients was 5 ± 2.7 , with widowed women accounting for 41.7% of cases. Hormonal contraception. These sociodemographic factors are not significantly associated with the occurrence of precancerous lesions in women, but in some studies, they remain the factors that can positively or negatively influence the occurrence of cervical cancer [15] [20].

4.1. Limits and Strengths

The study's strength comes in providing the epidemiological aspects of cytopathological results of cervical lesions in resource-limited situations where the frequency of these lesions is unknown. The study does not use genotyping, which is a limitation given the wide range of co-infections and viruses that may be present in HIV-infected patients; thus, future researchers should conduct a randomized genotypic study comparing the various viruses and co-infections, particularly their impact on precancerous lesions and the occurrence of cervical cancer.

4.2. Conclusion

HIV infection and precancerous cervical lesions are underdiagnosed, despite their high frequency among women in the Democratic Republic of Congo. As a result, early screening campaigns remain the best way to control the occurrence of cervical cancer in this category of the population, requiring the cervical smear to be

included among mandatory examinations for women with declining immunity linked to HIV infection in resource-limited countries. In epidemiological terms, primary prevention will therefore be the key element in cancer detection.

Most women are familiar with the risk factors following unprotected intercourse or early conception. However, conceiving a pregnancy reduces the risk of high-grade lesions, whereas a high number of former sexual partners increases this risk. Systematic cervical smear screening of all sexually active girls, with or without HIV infection, would improve long-term follow-up of cancerous lesions if detected early.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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