

HIV prevalence among cervical (pre)cancer diagnoses in Suriname: a retrospective population study

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ABSTRACT

Objective. To determine the prevalence of HIV in women with (pre)cancerous cervical lesions in Suriname and their retention in care.

Methods. A retrospective population study including all women diagnosed with (pre)invasive cervical intraepithelial neoplasia (CIN I to III or cervical cancer) in the only pathology department, during 2010–2020. The HIV test coverage and the HIV positivity ratio were determined through matching pathology data with the national HIV test database. The relation between retention in HIV care up to 2022 and different covariates was determined through Kaplan–Meier survival analysis and log-rank tests.

Results. There were 2 901 (1 395 CIN I, 396 CIN II, 444 CIN III, and 666 cervical cancer) diagnoses of (pre)invasive cervical neoplasia. An overall HIV test coverage of 57.5% and a positivity ratio of 5.8% were found, with no difference among the (pre)cancer stages. The undiagnosed prevalence (women not previously known HIV-positive at cervical diagnosis) was 1.6% and 2.9% among precancer and cancer diagnoses, respectively. The median time in care of women with cervical cancer was 8 months for those not on antiretroviral therapy (ART) and 4 years for those starting ART. Among women with precancer stages this was 5 and 10 years, respectively ($p < 0.05$).

Conclusions. HIV testing, followed by treatment initiation when found HIV-positive, should be prioritized in women diagnosed with cervical neoplasia. This will enhance the individual clinical outcomes and facilitate the control of the HIV epidemic in Suriname.

Keywords

HIV infections; uterine cervical neoplasms; retrospective studies; Suriname.

Human immunodeficiency virus (HIV) remains a global public health problem, with an estimated 9.9 million people living with HIV in 2023. The risk of HIV transmission increases when other sexually transmitted infections (STI) are present (1). Given the similar epidemiologic risk factors for transmission and the potentiation between infectious pathogens, the World Health Organization (WHO) emphasizes the importance of strategies addressing the combined disease burden.

One of the most prevalent STIs is human papillomavirus (HPV) (2), which is the major etiologic agent of cervical (pre)cancer lesions (3–5). Globally, cervical cancer is the fourth most common cancer among females, with approximately 570 000 cases and 311 000 deaths annually (6). A higher incidence of cervical intraepithelial neoplasia (CIN) has been reported in women living with HIV (7, 8). This correlates with the higher prevalence of HPV (54% versus 27%) in people living with HIV (9). Women living with HIV are six times more likely to progress

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to cervical cancer (10), especially those with lower CD4 counts (11). This coincides with more frequent positive HPV tests in those with CD4 counts less than 200 copies/ μ L (93% versus 48%) (12). The clearance of oncogenic HPV types is promoted by providing antiretroviral therapy (ART) for HIV (11, 13).

Both HIV and cervical cancer are more prevalent in developing countries (1, 3). Even after ART initiation, a more than 2 and 11 times higher frequency of cervical cancer among women living with HIV was recorded in Latin America and Africa, respectively, compared to in Europe (14). Screening, early diagnosis, and treatment of cancerous cervical lesions were shown to be effective in reducing risk and achieving comparable cervical cancer incidence rates for HIV-positive and HIV-negative women (15), earmarking these activities as key interventions for vulnerable women at high risk for HIV and cervical cancer (2). Additionally, for people living with HIV, retention in care and treatment is important to achieve and maintain viral suppression and to prevent opportunistic infections, which overall leads to better public health and clinical outcomes (16).

In Suriname, a multi-ethnic country in South America, both HIV and cervical cancer are prevalent diseases. There are an estimated 7 400 (6 500–8 400) people living with HIV, equating to an adult prevalence of 1.6% in 2023 (17), and only 50% of people living with HIV know their HIV status (18). With 25–35 deaths annually, cervical cancer is the second leading cause of cancer deaths among Surinamese women. With an incidence of 23.7 per 100 000 it is the fourth highest ranking for estimated age-standardized incidence rates in South America (19). A cross-sectional study reviewing cervical cancer cases in Suriname detected 11 HPV types, of which HPV 16 and 18 were most frequent (20).

Although national protocols for screening and treatment of HIV and cervical cancer exist in Suriname, actual data on the combined disease burden are not known. This study, therefore, aims to evaluate the continuum of HIV care for women with cervical cytologic and histologic changes by determining the HIV test coverage, HIV prevalence, and retention in care.

MATERIALS AND METHODS

Study design and setting

This study is a retrospective population study.

HIV program. Suriname implements a decentralized approach for HIV service provision. HIV testing is available through primary and secondary health care providers, either through walk-in facilities or by means of referral. The national protocol dictates that persons with an HIV-positive test result are referred to their family doctor for a complete medical work-up. The national HIV treatment guideline follows the test-and-treat strategy, and antiretroviral medications are dispensed free of charge. Also, annual screening for cervical cancer is recommended for all women living with HIV (21).

Cervical cancer program. Suriname has no formal national screening program for cervical cancer. For diagnosis either a Pap smear or visual inspection with acetic acid (VIA) combined with colposcopy and biopsy are carried out. Biopsies are evaluated at the sole pathology laboratory, and the results may either be negative, cervical intraepithelial neoplasia (CIN I,

CIN II or CIN III), or cervical cancer. CIN I management entails biannual follow-up. For CIN II and CIN III, cryotherapy, loop electrosurgical excision procedure (LEEP), or cold knife cone biopsy are done. Cervical cancer cases are discussed in multidisciplinary meetings, where treatment options (surgery, radiotherapy, chemotherapy, hormone therapy) are decided. Currently HIV testing is only advised in cases of cervical cancer diagnosis (22).

Study population

The study population was all women, irrespective of age, with (pre)invasive cervical neoplasia diagnosed in the pathology laboratory during 2010–2020. Depending on the abnormality of the cells under the microscope and the level of cervical tissue damage, there is a classification of precancer (CIN I to III) or cervical cancer (23, 24).

Data sources

Database of the Academic Hospital Paramaribo Department of Pathology. Upon receipt of samples for evaluation, the person's demographic information and pathology findings are entered in a database.

HIV databases. The **national HIV Patient Master Index (PMI)** is the national case-based surveillance database, created through a process of linking the databases on HIV testing, HIV treatment, CD4 count and viral load (VL), and elimination of mother-to-child transmission (EMTCT). It contains a unique set of individuals (25). The HIV PMI was linked to the pathology database using the unique identifier. Information such as HIV treatment, date of last contact, etc., were extracted and merged with information from the pathology database. The **national HIV test database** collects information about HIV tests done in the country. Information is collected either electronically or paper-based from the implementing organization and then entered in the national database. The **Radio Therapeutic Center (RTC) database** contains the demographic and clinical information on women with cervical cancer discussed during multidisciplinary meetings. The cervical cancer stage at diagnosis was obtained from this database.

Variables and definitions

The cervical-HIV cascade was evaluated in seven steps with additional analysis within each step. An overview of the cervical-HIV cascade indicators, definitions, and data sources is provided in Table 1.

Statistical analysis

The clinical and demographic characteristics for each step were described. The categorical variables were described as proportions and the numerical variables as mean and standard deviation (SD). The median and interquartile range (IQR) were used where data were not normally distributed. For cascade step 3, the odds ratio (OR) for each independent factor was calculated related to HIV test result using univariate logistic regression; factors with a *p* value less than 0.05 were considered significant. The retention in HIV care until

TABLE 1. Cervical–HIV cascade indicators, definitions, and data source

Cascade step	Definition and source	Additional analysis
1. Number of women diagnosed with cervical pathology during 2010–2020	Women in the pathology database diagnosed during 2010–2020 with (pre)invasive cervical neoplasia. For women with more than one diagnosis the more severe was taken.	Descriptive analysis of 2010–2020 cohort by cervical pathology type, age, residence, cervical cancer stage.
2. Number of women with cervical pathology tested for HIV	HIV test result on record, retraced by linking to the national HIV test database. The test date closest to the date of cervical diagnosis was taken.	HIV test coverage by cervical diagnosis.
3. Number of women with cervical pathology testing HIV-positive	All women with an HIV-positive test result matching to the national test database or with a match to the HIV Patient Master Index (PMI) were classified as HIV-positive.	a. HIV prevalence among women diagnosed with (pre) invasive cervical neoplasia. • Prevalence undiagnosed HIV: the positivity ratio after exclusion of women already diagnosed with HIV before the cervical pathology. b. Factors related to positivity: age, ethnicity, insurance, stage of (pre)invasive cervical neoplasia, district (area of residence).
4. Number of women with cervical–HIV comorbidity linked to HIV care	Linking with the HIV PMI, the woman was defined as linked based on having either a CD4 count result, VL result, or ART dispensing on record.	Disaggregated by cervical diagnosis.
5. Number of women with cervical–HIV comorbidity with ART initiation	From the PMI, ART yes/no was classified.	Disaggregated by cervical diagnosis.
6. Number of women with cervical–HIV comorbidity with VL suppression	The last recorded VL result is 1 000 copies/mL or less among those initiated on ART.	Disaggregated by cervical diagnosis.
7. Number of women with cervical–HIV comorbidity retained in care	The median or mean time in HIV care from cervical diagnosis until 2022 was calculated. This is based on last contact registered in the PMI.	Disaggregated by precancer diagnoses and cervical cancer; the factors residence area, ART use, and insurance were evaluated.

ART: antiretroviral therapy; PMI: Patient Master Index; VL: viral load.
Source: Prepared by the authors.

2022 was determined through Kaplan–Meier survival analysis and log-rank tests for comparison of different categories. The median time in care is reported; the mean time in care is given instead where the time in care is too short to report the median.

RESULTS

In the period 2010–2020, a total of 2 901 women were diagnosed with a form of cervical neoplasia in Suriname. Their median age was 41 years (IQR 33–50). CIN I accounted for 48.1% ($n = 1\,395$) and cervical cancer for 23% (Table 2). Of the 317 (47.6%) women with cervical cancer for which the stage was known, 84.2% were diagnosed in stage 2 or later.

The HIV test coverage was on average 57.5% with no significant differences among the different cervical diagnoses ($p > 0.05$). The average HIV positivity ratio was 5.8%, showing no difference between cervical diagnoses ($p > 0.05$). An undiagnosed HIV prevalence of 1.6% and 2.9% was found for preinvasive neoplasia and cervical cancer, respectively. Women of Creole and Maroon ethnicity had an OR of 3.51 (95% CI [1.74, 7.08]) and 3.84 (95% CI [1.68, 8.78]), respectively, and so four times more likely to be HIV-positive compared to Hindustani women (Table 3).

Cervical–HIV comorbidity

Among the 2 901 women with cervical neoplasia, 100 were HIV-positive. Their median age was 37 (IQR 31–43). Excluding 10 women that were not found in the RTC database, 10 (77%) of

the women with HIV and cervical cancer were stage 2 or higher at diagnosis.

For women with CIN I, II, III, and cervical cancer, 68%, 78%, 67%, and 52%, respectively, were already enrolled in the HIV system before their cervical diagnosis. For the precancerous lesions the median time was 5 years (IQR –8 to 0.5) while for cervical cancer it was 1.5 years before (IQR –6.8 to 0.0).

With an average linkage to care of 95%, no difference was found in the different cervical neoplasia. ART initiation was on average 91.2% for women with precancerous lesions and 72.2% for women with cervical cancer (Figure 1). Based on the last viral load on record, 82.7% had achieved viral suppression.

Retention in care

Among women with cervical cancer, the overall median time in HIV care was almost two years. For the women with cervical cancer and HIV, among those who initiated ART their median time in care was 4.3 years compared to 8 months for those without ART ($p < 0.05$) (Figure 2).

For women diagnosed with CIN I to III, the average time in care was 10 years. Those on ART had a longer survival in care compared to those not on ART, with a mean duration in care of 5 years without ART compared to 10 years with ART ($p < 0.01$) (Figure 3).

Among women from the interior of the country, their median time in HIV care was 4 years compared to 10 years for women from urban or rural areas ($p < 0.01$).

TABLE 2. Sociodemographic characteristics and HIV test result of women with a cervical (pre)cancer diagnosis during 2010–2020

	Overall N (%)	CIN I n (%)	CIN II n (%)	CIN III n (%)	CCA n (%)
	2 901 (100)	1 395 (100)	396 (100)	444 (100)	666 (100)
Age group					
<25	148 (5.1)	108 (7.8)	29 (7.4)	6 (1.4)	4 (0.6)
25–34	735 (25.3)	455 (32.8)	118 (30.0)	109 (25.1)	48 (7.1)
35–44	903 (31.1)	479 (34.5)	116 (29.5)	147 (33.9)	157 (23.3)
45+	1 115 (38.4)	345 (24.9)	130 (33.1)	172 (39.6)	465 (69.0)
Residence area					
Urban	2 174 (74.9)	1 056 (75.7)	305 (77.0)	353 (79.5)	460 (69.1)
Rural	462 (15.9)	225 (16.1)	64 (16.2)	54 (12.2)	119 (17.9)
Interior	180 (6.2)	57 (4.1)	16 (4.0)	31 (7.0)	76 (11.4)
Unknown	85 (2.9)	57 (4.1)	11 (2.8)	6 (1.4)	11 (1.7)
Ethnicity					
Hindustani	724 (25.0)	414 (29.8)	86 (21.9)	96 (22.1)	125 (18.5)
Creole	708 (24.4)	346 (24.9)	107 (27.2)	111 (25.6)	139 (20.6)
Maroon	203 (7.0)	56 (4.0)	20 (5.1)	43 (9.9)	84 (12.5)
Javanese	526 (18.1)	249 (18.0)	79 (20.1)	74 (17.1)	122 (18.1)
Mixed	211 (7.3)	106 (7.6)	33 (8.4)	34 (7.8)	38 (5.6)
Other/unknown	431 (14.9)	216 (15.6)	68 (17.3)	76 (17.5)	166 (24.6)
Insurance category*					
Government	1 603 (55.3)	856 (61.4)	199 (50.3)	209 (47.1)	339 (50.9)
Private	1 298 (44.7)	539 (38.6)	197 (49.7)	235 (52.9)	327 (49.1)
HIV testing**					
Yes	1 667 (57.5)	778 (55.8)	224 (56.6)	263 (59.2)	402 (60.4)
No	1 234 (42.5)	617 (44.2)	172 (43.4)	181 (40.8)	264 (39.6)

CCA: cervical cancer; CIN: cervical intraepithelial neoplasia.

Notes: * Government includes all health insurances for which the government is responsible for the payment, while private includes out-of-pocket payments, payments by the company the person works for, etc. ** HIV test ever done (found on record).

Source: Prepared by the authors based on the study data.

DISCUSSION

This study revealed that almost 43% of women diagnosed with a (pre)invasive cervical neoplasia were never tested for HIV. An HIV prevalence of about 6% was found, with no difference in the various stages of neoplasia. The undiagnosed HIV prevalence was 1.6% and 2.9%, respectively, in preinvasive neoplasia and cervical cancer. Women who started HIV treatment where more than two times longer retained in care.

Most studies regarding the comorbidity of HIV and (pre)invasive cervical neoplasia focus on cervical neoplasia among people living with HIV. Global estimates indicate 5.8% of new cervical cancer diagnoses also had HIV (26). Little is known about the HIV and cervical pathology comorbidity in the Caribbean. There are an estimated 800 000 women living with HIV in Latin America and the Caribbean (27), and the prevalence of HPV is higher than the average worldwide prevalence (28, 29). This substantiates the observed prevalence of 6%, which is higher than the general HIV prevalence of 1.6%. The undiagnosed HIV prevalence figures found are similar to findings in Europe,

where among CIN II and III and cervical cancer, 1% were HIV-positive (30).

The current national treatment protocol for preinvasive neoplasia does not include HIV testing, which is only advised in case of cervical cancer diagnosis. The current study findings justify testing for HIV whenever cervical neoplasia is diagnosed; indicator condition testing has been found to be cost-effective when the undiagnosed HIV prevalence is 0.1% (31, 32). Further, we found that 40% of the cervical diagnoses were not tested for HIV, and two-thirds were known with HIV before their cervical diagnosis; this reiterates the importance of testing for HIV with a cervical diagnosis but also promoting regular cervical screening when HIV is diagnosed. This is important for public health measures and also of clinical importance, as HIV causes cervical neoplasia to progress rapidly (11).

In line with other studies, the importance of HIV treatment (ART) for women with both HIV and cervical pathology is emphasized. Previous studies mention decrease in the progression of cervical dysplasia and increased clearance of oncogenic HPV types with ART use (13, 33). More emphasis needs to be placed on getting people living with HIV onto treatment,

TABLE 3. Correlations with HIV test result

	HIV-negative n (%)	HIV-positive n (%)	Odds ratio	95% CI
Age group				
<25	106 (94.6)	6 (5.4)	--	--
25–34	540 (94.1)	34 (5.9)	1.11	0.46, 2.72
35–44	498 (92.7)	39 (7.3)	1.38	0.57, 3.35
45+	421 (95.2)	21 (4.8)	0.88	0.35, 2.24
Residence area				
Urban	1 145 (93.3)	75 (6.1)	--	--
Rural	258 (95.9)	11 (4.1)	0.65	0.34, 1.24
Interior	119 (93.7)	8 (6.3)	1.02	0.48, 2.18
Missing	43 (87.8)	6 (12.2)	--	--
Ethnicity				
Hindustani	328 (97.2)	10 (2.8)	--	--
Creole	411 (90.5)	44 (9.5)	3.51	1.74, 7.08**
Maroon	128 (90.6)	15 (9.4)	3.84	1.68, 8.78**
Javanese	253 (97.2)	7 (2.8)	0.91	0.34, 2.41
Mixed	134 (95.7)	6 (4.3)	1.47	0.52, 4.12
Other/unknown	311 (94.8)	18 (5.2)	1.90	0.86, 4.18
Insurance category*				
Government	864 (93.0)	65 (7.0)	--	--
Private	701 (95.2)	35 (4.8)	0.66	0.44, 1.01
Cervical pathology stage				
CCA	379 (94.3)	23 (5.7)	--	--
CIN I	736 (94.7)	41 (5.3)	0.92	0.54, 1.55
CIN II	206 (92.0)	18 (8.0)	1.44	0.76, 2.73
CIN III	244 (93.1)	18 (6.9)	1.21	0.64, 2.30

CCA: cervical cancer; CIN: cervical intraepithelial neoplasia.

Notes: *Government includes all health insurances for which the government is responsible for the payment, while private includes out-of-pocket payments, payments by the company the person works for, etc. ** $p < 0.05$.

Source: Prepared by the authors based on the study data.

because half of the women without treatment were previously known to be HIV-positive. These women have 95% linkage to care, 72% and 91% ART initiation for cervical cancer and precancerous lesions, and 83% viral suppression – similar outcomes to the general HIV-positive adult population in Suriname. For adults enrolled from 2010 to 2015, the linkage, ART initiation, and viral suppression were 80%, 67%, and 77%, respectively (18).

Another interesting finding related to retention in care was the area of residence. Women with HIV and precancerous lesions from urban areas remain three times longer in HIV care than those from the interior of the country. This difference is not found for women with cervical cancer, which may indicate access barriers to primarily HIV services. The initiation of ART for interior, rural, and urban areas is 75.0%, 81.8%, and 92.0%, respectively. A previous study also revealed increased odds of mother-to-child transmission of HIV among mothers from the interior. Early screening and treatment of both HIV and cervical neoplasia is needed. Barriers to timely healthcare

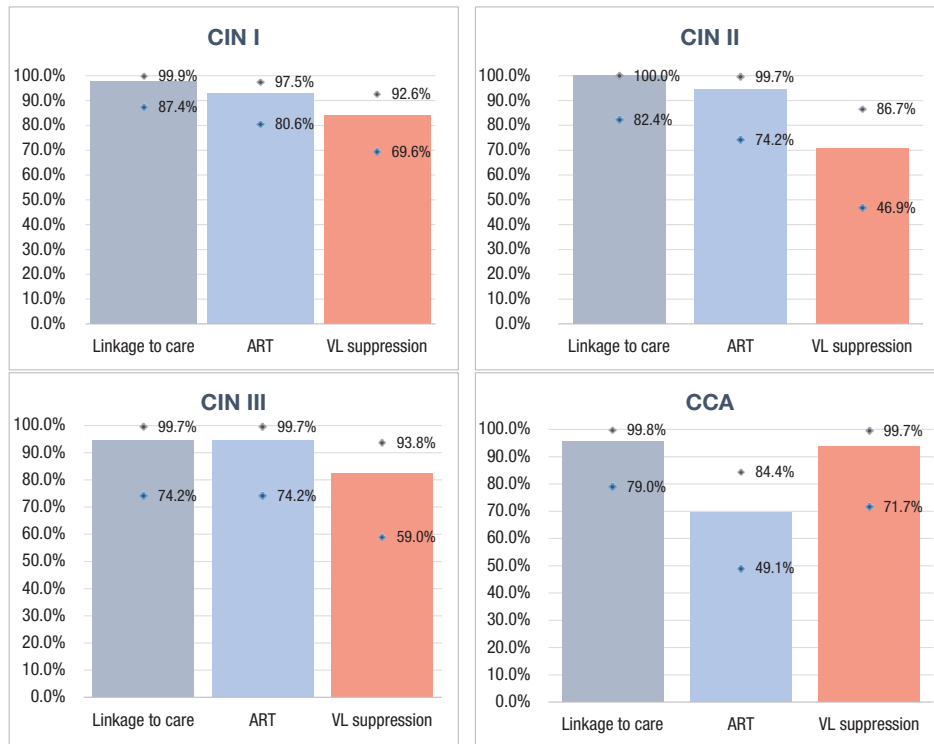
services for women from the interior need to be identified. In different studies the main barrier for HPV vaccination and cervical screening in low- and middle-income countries was lack of knowledge regarding HPV, cervical pathology risk, and the importance of screening, especially with HIV, in relation to cancer development (34, 36, 37). For Suriname the highest incidence of cervical cancer and mortality was found in Creole and Amerindian populations (38, 39). Preliminary results from a small study in Suriname also identified Creole and Maroon populations as at a higher risk for cervical cancer; on the other hand, it found that one-third of women were not aware of the importance of screening related to cancer. Other barriers mentioned were little to no information from healthcare workers and the transportation and distance to a screening site (40).

The data for this study were analyzed by linking different surveillance databases. Errors in coding or missing data could influence results and is a limitation of this study. To minimize the impact of errors in coding, probabilistic matching was done. Furthermore, specific reasons for women not being retained in care or missing an HIV test are not known. In calculating the HIV test coverage, anyone ever tested for HIV was considered; this means that women were not necessarily tested near their date of cervical diagnosis. For evaluation of adherence to protocol, dictating screening for cervical abnormalities in women living with HIV, a prospective study is advised.

Nevertheless, this study presents the first evaluation of HIV and cervical pathology in Suriname. In terms of recommendations, although code-matching is an issue, using existing national surveillance databases to facilitate evidence-based intervention is a viable option in resource-limited settings like Suriname. This can serve as a good starting point for a more comprehensive information system that regularly collects data on HIV and cervical neoplasia.

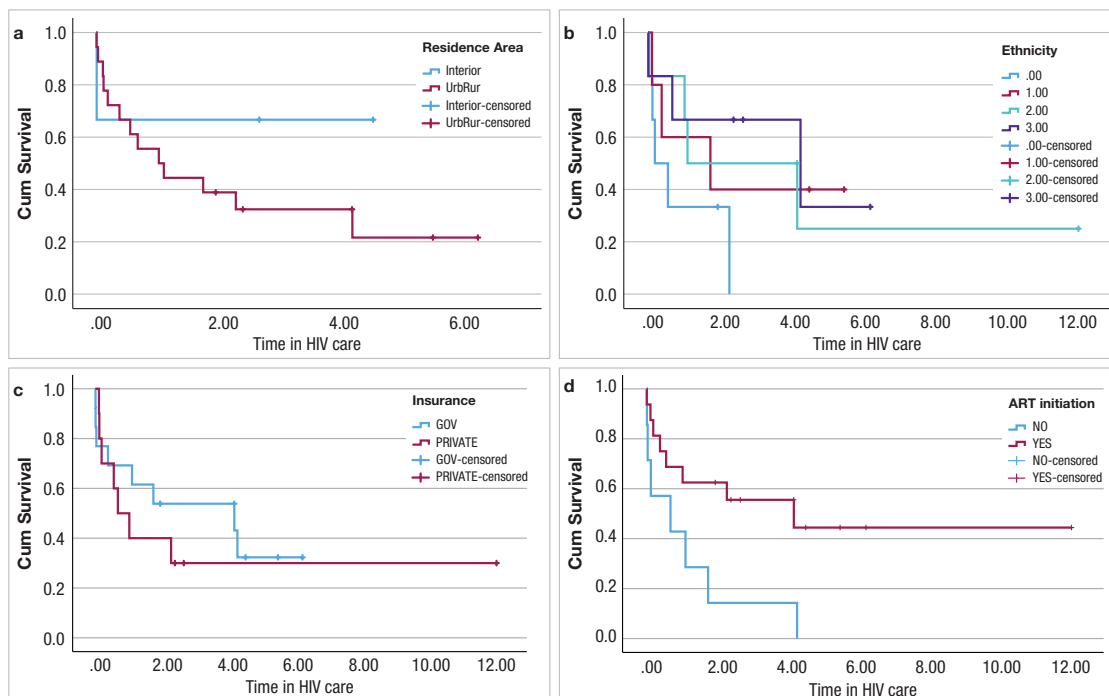
A second recommendation is to include routine HIV testing when CIN I to III are diagnosed, justified by the high percentage undiagnosed HIV prevalence found. This will facilitate better clinical outcomes but also help in achieving the HIV target of, by 2030, 95% of people living with HIV know their HIV status. A third recommendation is the promotion of HPV vaccination, as HPV is the major cause of cervical neoplasia. The HPV vaccination coverage for Suriname is 3% (41). Implementation of the Pan American Health Organization (PAHO)/WHO recommendations is warranted; this would mean cervical screening starting at 25 years, instead of 30 years, for women living with HIV. Also, HPV vaccination is recommended for girls and boys aged 9–14 years and for those living with HIV up to 26 years (27). This would facilitate integration of both services, promoting essential treatment and care for both HIV and cervical pathology. Fourth, health education explaining HIV and cervical neoplasia comorbidity, HPV vaccination, and the risks and benefits of screening and vaccination needs to be accelerated, both for the general population and healthcare workers. Lastly, further research is needed to identify barriers to timely access to the healthcare system and retention in care, especially for women living in the interior of the country. This will facilitate the development of tailored interventions addressing the burden of HIV and cervical pathology in Suriname.

FIGURE 1. HIV treatment cascade for women with a cervical neoplasia diagnosis during 2010–2020 and HIV infection, including 95% confidence interval

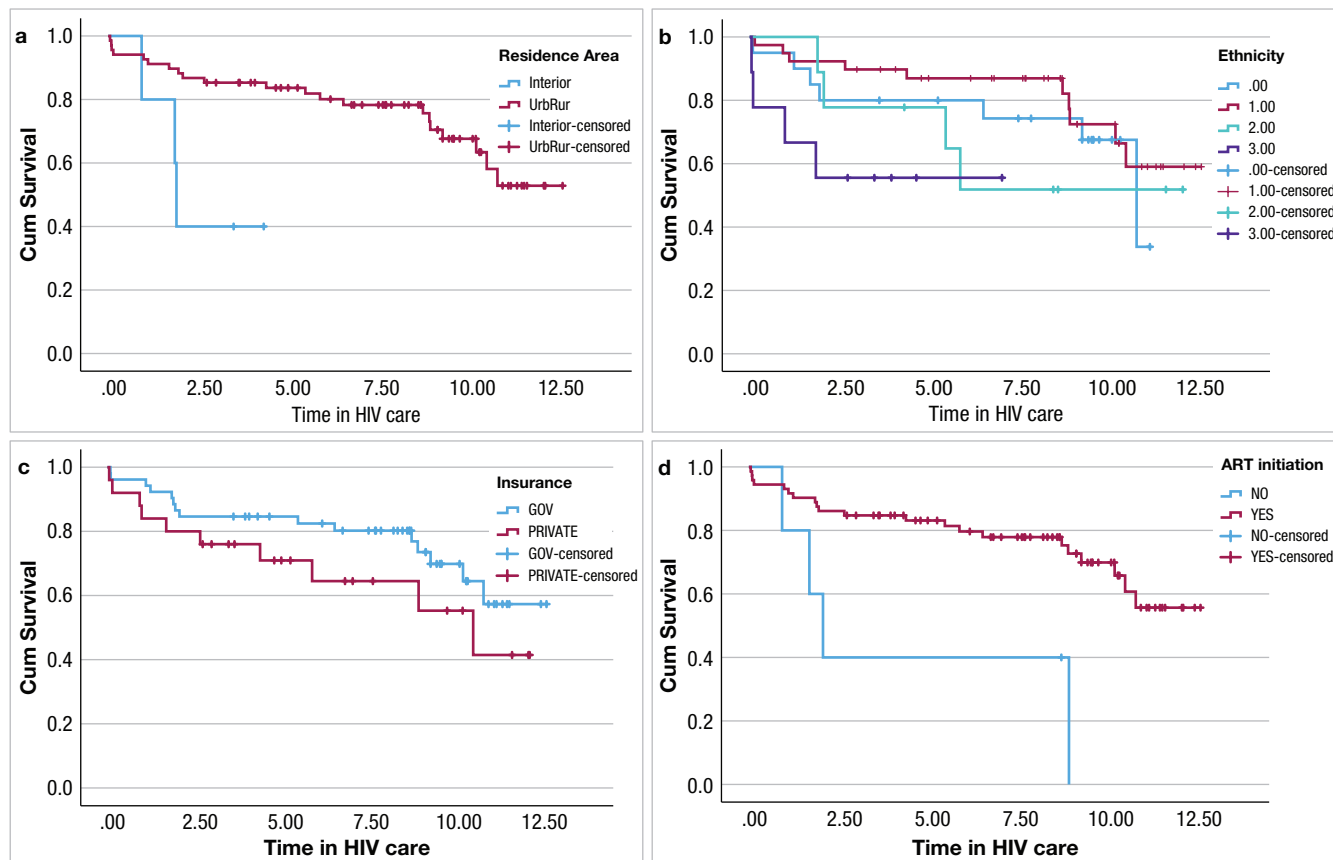


ART: antiretroviral therapy; CCA: cervical cancer; CIN: cervical intraepithelial neoplasia; VL: viral load.
Source: Prepared by the authors based on the study data.

FIGURE 2. Kaplan–Meier survival analysis for sociodemographic and clinical factors related to time in care for women with cervical cancer and HIV



ART: antiretroviral therapy; Gov: Government; UrbRur: urban and rural areas together.
Note: Ethnicity: 0 = Amerindian, Hindustani, Javanese, Mixed; 1 = Creole; 2 = Maroon; 3 = Other/unknown.
Source: Prepared by the authors based on the study data.

FIGURE 3. Kaplan–Meier survival analysis for sociodemographic and clinical factors related to time in care for women with preinvasive neoplasia and HIV

ART: antiretroviral therapy; Gov: Government; UrbRur: urban and rural areas together.
 Note: Ethnicity: 0 = Amerindian, Hindustani, Javanese, Mixed; 1 = Creole; 2 = Maroon; 3 = Other/unknown.
 Source: Prepared by the authors based on the study data.

Conclusion

Similar HIV prevalence was found in women with cervical cancer or an earlier stage of neoplasia in Suriname. Also, HIV treatment doubles the retention in care among women with both HIV and a cervical (pre)cancerous lesion. With half of people living with HIV in Suriname not knowing their HIV status, and no difference in HIV prevalence among the different stages of cervical neoplasia and high undiagnosed prevalence, the recommendation is to include routine HIV testing for all cervical neoplasia diagnoses. Also, the current protocol where routine cervical screening is advised for women living with HIV should be enforced. This will facilitate early diagnosis, improve clinical outcomes, and ultimately help Suriname reach the target of reducing new HIV infections.

Author contributions. DS, RC, and AG conceived the original study design with feedback and adaptation by the other authors. DS, WS, and MM undertook the analysis with feedback from all authors. MA and WS were responsible for the overall supervision of the study. DS drafted the manuscript. All authors critically revised and approved the final version.

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REFERENCES

- World Health Organization. WHO fact sheet HIV and AIDS. Geneva: WHO; 2024 [cited 2024 Aug 21]. Available from: <https://www.who.int/news-room/fact-sheets/detail/hiv-aids>.
- World Health Organization, UNAIDS. HIV and Cervical Cancer. Geneva: WHO; 2022 [cited 2023 May 30]. Available from: https://cdn.who.int/media/docs/default-source/hq-hiv-hepatitis-and-stis-library/hiv-hpv-infograph-unaid-who-nov-2022.pdf?sfvrsn=58533b09_2.
- World Health Organization. Cervical cancer: key facts. Geneva: WHO; 2022 [cited 2023 May 31]. Available from: <https://www.who.int/news-room/fact-sheets/detail/cervical-cancer>.
- Schiffman MH, Bauer HM, Hoover RN, Glass AG, Cadell DM, Rush BB, et al. Epidemiologic evidence showing that human papillomavirus infection causes most cervical intraepithelial neoplasia. *J Natl Cancer Inst.* 1993;85(12):958–964. <https://doi.org/10.1093/jnci/85.12.958>.
- Kaufman RH, Adam E, Icenogle J, Lawson H, Lee N, Reeves KO, et al. Relevance of human papillomavirus screening in management of cervical intraepithelial neoplasia. *Am J Obstet Gynecol.* 1997;176(1):87–92. [https://doi.org/10.1016/s0002-9378\(97\)80017-8](https://doi.org/10.1016/s0002-9378(97)80017-8).
- Bruni L, Albero G, Mena M, Collado JJ, Gómez D, Muñoz J, et al. Human Papillomavirus and Related Diseases Report in the World. Summary Report 10 March 2023. Barcelona: ICO/IARC Information Centre on HPV and Cancer; 2023 [cited 2023 Apr 25]. Available from: <https://hpvcentre.net/statistics/reports/XWX.pdf>.
- Duerr A, Kieke B, Warren D, Shah K, Burk R, Peipert JF, et al. Human papillomavirus-associated cervical cytologic abnormalities among women with or at risk of infection with human immunodeficiency virus. *Am J Obstet Gynecol.* 2001;184(4):584–590. <https://doi.org/10.1067/mob.2001.111791>.
- Wright TC Jr, Ellerbrock TV, Chiasson MA, Van Devanter N, Sun XW. Cervical intraepithelial neoplasia in women infected with human immunodeficiency virus: prevalence, risk factors, and validity of Papanicolaou smears. *New York Cervical Disease Study. Obstet Gynecol.* 1994;84(4):591–597. PMID: 8090399.
- World Health Organization. Human papillomavirus vaccines: WHO position paper (2022 update). *Wkly Epidemiol Rec.* 2022;97(50):645–672. Available from: <https://iris.who.int/handle/10665/365350>.
- World Health Organization. Global strategy to accelerate the elimination of cervical cancer as a public health problem. Geneva: WHO; 2020. Available from: <https://iris.who.int/handle/10665/336583>.
- Denslow SA, Rositch AF, Firnhaber C, Ting J, Smith JS. Incidence and progression of cervical lesions in women with HIV: a systematic global review. *Int J STD AIDS.* 2014;25(3):163–177. <https://doi.org/10.1177/0956462413491735>.
- Ahdieh L, Muñoz A, Vlahov D, Trimble CL, Timpson LA, Shah K. Cervical Neoplasia and repeated positivity of human papillomavirus infection in human immunodeficiency virus-seropositive and -seronegative women. *Am J Epidemiol.* 2000;151(12):1148–1157. <https://doi.org/10.1093/oxfordjournals.aje.a010165>.
- Ogu CO, Achukwu PU, Nkwo PO. Prevalence and Risk Factors of Cervical Dysplasia among Human Immunodeficiency Virus Sero-Positive Females on Highly Active Antiretroviral Therapy in Enugu, Southeastern, Nigeria. *Asian Pac J Cancer Prev.* 2019;20(10):2987–2994. <https://doi.org/10.31557/apjcp.2019.20.10.2987>.
- Rohner E, Bütikofer L, Schmidlin K, Sengayi M, Maskew M, Giddy J, et al. Cervical cancer risk in women living with HIV across four continents: A multicohort study. *Int J Cancer.* 2020;146(3):601–609. <https://doi.org/10.1002/ijc.32260>.
- Menon S, Wusiman A, Boily MC, Kariisa M, Mabeya H, Luchters S, et al. Epidemiology of HPV Genotypes among HIV Positive Women in Kenya: A Systematic Review and Meta-Analysis. *PLoS One.* 2016;11(10):e0163965. <https://doi.org/10.1371/journal.pone.0163965>.
- Waldrop-Valverde D, Guo Y, Ownby RL, Rodriguez A, Jones DL. Risk and protective factors for retention in HIV care. *AIDS Behav.* 2014;18(8):1483–1491. <https://doi.org/10.1007/s10461-013-0633-7>.
- Joint United Nations Programme on HIV/AIDS. Suriname: country factsheet 2023. Geneva: UNAIDS; 2023 [cited 2024 Aug 21]. Available from: <https://www.unaids.org/en/regionscountries/countries/suriname>.
- Stijnberg D, Kee MM, Bergs J, Adhin MR, Schrooten W. The continuum of care for people living with HIV in Suriname: identifying factors influencing the care delivery process. *IJQC Commun.* 2022;2(2):lyac013. <https://doi.org/10.1093/ijqcoms/lyac013>.
- Ministry of Health Suriname. National Strategic Plan: Prevention and Control of Cervical Cancer 2021–2030. Paramaribo: Ministry of Health Suriname; 2022.
- Grunberg MG, Chan M, Adhin MR. Distinctive distribution of HPV genotypes in cervical cancers in multi-ethnic Suriname: implications for prevention and vaccination. *Epidemiol Infect.* 2017;145(2):245–253. <https://doi.org/10.1017/s0950268816002132>.
- Ministry of Health Suriname. *Herziene Nationale Richtlijn 2018. Instelling op ART en vervolgzorg van HIV-geïnfecteerde adolescenten en volwassenen in de primaire gezondheidszorg van Suriname.* Paramaribo: Ministry of Health Suriname; 2018. Available from: http://antibiotica.sr/wp-content/uploads/2019/08/Herziene-Richtlijn_hiv-adult_Final.pdf.
- Vakgroep Gynaecologen Suriname. *Cervix Screening: Volledige richtlijn 2020. Gynaecologie Suriname app -Surinaamse richtlijnen -cervix screening.* [Paramaribo: [Vakgroep Gynaecologen Suriname; Zita Prüst]; 2022. Available from: <https://play.google.com/store/apps/details?id=app.gynaecologiesuriname>.
- National Cancer Institute. *HPV and Pap Test Results: Next Steps after an Abnormal Cervical Cancer Screening Test.* Bethesda: National Cancer Institute; 2024 [cited 2024 Aug 26]. Available from: <https://www.cancer.gov/types/cervical/screening/abnormal-hpv-pap-test-results>.
- World Health Organization. WHO guideline for screening and treatment of cervical pre-cancer lesions for cervical cancer prevention: use of dual-stain cytology to triage women after a positive test for human papillomavirus (HPV). Geneva: WHO; 2024 [cited 2024 Aug 26]. Available from: <https://iris.who.int/handle/10665/376492>.
- Stijnberg D, Mc Kee M, Adhin M, Schrooten W. Development of the HIV Patient Master Index: a basis for monitoring the HIV Continuum of Care and formulating Interventions for People living with HIV in Suriname. [Abstracts from the 11th European Congress on Tropical Medicine and International Health, 16–20 September 2019 Liverpool, UK. Abstract P317.] *Trans R Soc Trop Med Hyg* 2019;113:S195–S195. https://doi.org/10.1093/trstmh/trz090_Poster_Abstacts_Wednesday.
- Stelzle D, Tanaka LF, Lee KK, Ibrahim Khalil A, Baussano I, Shah ASV, et al. Estimates of the global burden of cervical cancer associated with HIV. *Lancet Glob Health.* 2021;9(2):e161–169. [https://doi.org/10.1016/s2214-109x\(20\)30459-9](https://doi.org/10.1016/s2214-109x(20)30459-9).
- Pan American Health Organization. *Cervical cancer in women with HIV in Latin America and the Caribbean: update and steps towards elimination.* Washington, D.C.: PAHO; 2021. Available from: <https://iris.paho.org/handle/10665.2/55706>.
- Almonte M, Albero G, Molano M, Carcamo C, García PJ, Pérez G. Risk factors for human papillomavirus exposure and co-factors for cervical cancer in Latin America and the Caribbean. *Vaccine.* 2008;26 Suppl 11:L16–36. <https://doi.org/10.1016/j.vaccine.2008.06.008>.
- Caicedo-Martínez M, Fernández-Deaza G, Ordóñez-Reyes C, Olejua P, Nuche-Berenguer B, Mello MB, et al. High-risk human papillomavirus infection among women living with HIV in Latin America and the Caribbean: A systematic review and meta-analysis. *Int J STD AIDS.* 2021;32(14):1278–1289. <https://doi.org/10.1177/09564624211037498>.
- Bull L, Rayment M. HIV-indicator-condition-driven HIV testing: clinically effective but still rarely implemented. *Clin Med (Lond).* 2016;16(2):175–179. <https://doi.org/10.7861/clinmedicine.16-2-175>.
- Bogers SJ, Schim Van Der Loeff MF, Davidovich U, Boyd A, van der Valk M, Brinkman K, et al. Promoting HIV indicator condition-guided testing in hospital settings (PROTEST 2.0): study protocol for a multicentre interventional study. *BMC Infect Dis.* 2021;21(1):519. <https://doi.org/10.1186/s12879-021-06183-8>.
- Yazdanpanah Y, Sloan CE, Charlois-Ou C, Le Vu S, Semaille C, Costagliola D, et al. Routine HIV screening in France: clinical impact and cost-effectiveness. *PLoS One.* 2010;5(10):e13132. <https://doi.org/10.1371/journal.pone.0013132>.

33. Blitz S, Baxter J, Raboud J, Walmsley S, Rachlis A, Smail F, et al. Evaluation of HIV and highly active antiretroviral therapy on the natural history of human papillomavirus infection and cervical cytopathologic findings in HIV-positive and high-risk HIV-negative women. *J Infect Dis*. 2013;208(3):454–462. <https://doi.org/10.1093/infdis/jit181>.
34. Huff KA, Braun A, Salvaggio MR, McGough P, Frank-Pearce SG, Kendzor DE, et al. Promoting HPV Vaccination in People with HIV: Factors to Consider. *Int J Environ Res Public Health*. 2023;20(7):5345. <https://doi.org/10.3390/ijerph20075345>.
35. Stijnberg D, Holband S, Charles R, Ulenaers D, Schrooten W, Adhin MR. Evaluating elimination of mother-to-child transmission of HIV in Suriname: a mixed method study. *Rev Panam Salud Publica*. 2023;47:e159. <https://doi.org/10.26633/rpss.2023.159>.
36. Williams M, Moneyham L, Kempf MC, Chamot E, Scarinci I. Structural and sociocultural factors associated with cervical cancer screening among HIV-infected African American women in Alabama. *AIDS Patient Care STDS*. 2015;29(1):13–19. <https://doi.org/10.1089/apc.2014.0063>.
37. Guillaume D, Chandler R, Igbinoba S. Barriers to Cervical Cancer Screening Among Women Living With HIV in Low- and Middle-Income Countries: A Systematic Review. *J Assoc Nurses AIDS Care*. 2020;31(5):497–516. <https://doi.org/10.1097/jnc.00000000000000194>.
38. Dams ETM, Hawkins WB, Lichtveld MY. Introduction of Radiotherapy in Suriname: Impact on the Treatment of Cervical Cancer. [Meeting Abstract: 2016 Global Cancer Research Symposium]. *J Glob Oncol*. 2016;2(3_suppl):49s–49s. <https://doi.org/10.1200/JGO.2016.003889>.
39. Irving E, Mans D. Age and Ethnic Differences in the Occurrence of Cervical Dysplasia, Cervical Cancer, and Cervical Cancer Deaths in Suriname. *Transl Biomed*. 2015 [cited 2023 Sep 15];6(1):1. Available from: <https://www.itmedicalteam.pl/articles/age-and-ethnic-differences-in-the-occurrence-of-cervical-dysplasia-cervical-cancer-and-cervicalcancer-deaths-in-suriname-108448.html>.
40. Bandhoe N. Project End Report phase I Nov - Dec 2018. Improve cervical cancer screening coverage in vulnerable populations through a community-based approach in District Wanica. Paramaribo: Lobi Foundation; 2019.
41. Bruni L, Albero G, Mena M, Collado J, Gómez D, Muñoz J, et al. Human Papillomavirus and Related Diseases Report in Suriname. Summary Report 10 March 2023. Barcelona: ICO/IARC Information Centre on HPV and Cancer; 2023 [cited 2023 Apr 25]. Available from: <https://hpvcentre.net/statistics/reports/SUR.pdf>.

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Prevalencia del VIH en los casos diagnosticados de lesiones cervicouterinas (pre)cancerosas en Suriname: estudio poblacional retrospectivo

RESUMEN

Objetivo. Determinar la prevalencia del VIH en mujeres con lesiones cervicouterinas (pre)cancerosas en Suriname y su permanencia en la atención de salud.

Métodos. Estudio poblacional retrospectivo en el que se incluyó a todas las mujeres a las que se diagnosticó una neoplasia intraepitelial cervicouterina (pre)invasiva (NIC I a III o cáncer cervicouterino) en el único departamento de anatomía patológica, entre el 2010 y el 2020. La cobertura de las pruebas del VIH y la tasa de positividad para el VIH se determinaron mediante el cotejo de los datos anatomopatológicos con la base de datos nacional de pruebas del VIH. La relación entre la permanencia en los servicios de atención a la infección por el VIH hasta el 2022 y las distintas covariables se determinó mediante un análisis de supervivencia de Kaplan-Meier y pruebas de orden logarítmico.

Resultados. Hubo 2901 diagnósticos de neoplasia cervicouterina (pre)invasiva (1395 de NIC I, 396 de NIC II, 444 de NIC III y 666 de cáncer cervicouterino). Se observó una cobertura general de las pruebas del VIH del 57,5% y una tasa de positividad del 5,8%, sin diferencias entre los estadios de las lesiones precancerosas. La prevalencia no diagnosticada (mujeres sin positividad conocida previa para el VIH en el momento del diagnóstico del cáncer cervicouterino) fue del 1,6% y el 2,9% en las diagnosticadas de lesiones precancerosas y cáncer, respectivamente. La mediana del tiempo de permanencia en la atención de salud de las mujeres con cáncer cervicouterino fue de 8 meses en las que no recibían tratamiento antirretroviral y de 4 años en las que lo iniciaban. En el caso de las mujeres en estadio precancerosos fue de 5 y 10 años, respectivamente ($p < 0,05$).

Conclusiones. La realización de las pruebas del VIH, seguidas de un inicio del tratamiento al detectar un resultado positivo para el VIH, debe ser una prioridad en el caso de las mujeres a las que se diagnostica una neoplasia cervicouterina. Esto permitirá mejorar los resultados clínicos individuales y contribuirá al control de la epidemia de la infección por el VIH en Suriname.

Palabras clave

Infecciones por VIH; neoplasias del cuello uterino; estudios retrospectivos; Suriname.

Prevalência de HIV em pacientes diagnosticadas com lesões cervicais (pré-) cancerosas no Suriname: estudo populacional retrospectivo

RESUMO

Objetivo. Determinar a prevalência de infecção pelo HIV em mulheres com lesões cervicais (pré-)cancerosas no Suriname e a retenção dessas pacientes no cuidado.

Métodos. Estudo populacional retrospectivo incluindo todas as mulheres diagnosticadas com neoplasia intraepitelial cervical (pré-)invasiva (NIC I a III ou câncer do colo do útero) em um único serviço de patologia no período de 2010 a 2020. Os dados de patologia foram cruzados com a base nacional de dados de testes de HIV para determinar a cobertura de testagem do HIV e o índice de positividade. A relação entre a retenção no cuidado do HIV até 2022 e diferentes covariáveis foi determinada por meio da análise de sobrevivência de Kaplan-Meier e testes de log-rank.

Resultados. Houve 2901 diagnósticos de neoplasia cervical (pré-)invasiva (1395 NIC I, 396 NIC II, 444 NIC III e 666 casos de câncer do colo do útero). A cobertura geral do teste de HIV foi de 57,5%, com um índice de positividade de 5,8%, e não houve diferença entre os estágios da lesão cervical. A prevalência não diagnosticada (mulheres que não sabiam ser soropositivas para o HIV no momento do diagnóstico da lesão cervical) foi de 1,6% e 2,9% para os diagnósticos de lesões pré-cancerosas e cancerosas, respectivamente. O tempo mediano de tratamento de mulheres com câncer do colo do útero foi de 8 meses entre as que não receberam terapia antirretroviral (TARV) e de 4 anos entre as que iniciaram TARV. Entre as mulheres com lesões pré-cancerosas, esses períodos foram de 5 e 10 anos, respectivamente ($p < 0,05$).

Conclusões. A testagem de HIV, seguida de início do tratamento em caso de resultado positivo, deve ser priorizada em mulheres diagnosticadas com neoplasia cervical. Isso melhorará os resultados clínicos individuais e facilitará o controle da epidemia de HIV no Suriname.

Palavras-chave Infecções por HIV; neoplasias do colo do útero; estudos retrospectivos; Suriname.