Acta Scientific Microbiology (ISSN: 2581-3226)

Volume 7 Issue 4 April 2024

Research Article

Prevalence and Factors Associated with Human Papillomavirus Infection Among Women Living with HIV in Ouagadougou

KY Absatou[1], Ouattara A[1], Tondé Issa[2], Ky AY[3], Idogo G[1], Sanou Mahamoudou[2]* and Sanou I[4]

[1]*Bogodogo University Teaching Hospital, Burkina Faso*

[2]*Charles De Gaulle Pediatric University Teaching Hospital, Burkina Faso*

[3]*Word Vision International, Burkina Faso*

[4]*Tengandogo University Teaching Hospital, Burkina Faso*

***Corresponding Author:** Sanou Mahamoudou, Charles De Gaulle Pediatric University Teaching Hospital, Burkina Faso.

DOI: 10.31080/ASMI.2024.07.1366

Received: February 12, 2024

Published: March 03, 2024

Abstract

Background: Cervical cancer represents a major health problem. It is associated with the carriage of some types of high-risk papillomas. In Burkina, data on the prevalence and spectrum of genital papilloma infection in women living with HIV are poorly available.

Objective: To study human oncogenic genital papillomavirus infection in women living with HIV.

Methodology: This was a descriptive and analytical cross-sectional study which took place at CHU B between August 2021-February 2023. It concerned patients living with HIV in whom the search for Human Papillomavirus (HPV) on cervical cells and HIV viral load and CD4 lymphocyte counts were carried out. The Ceiphed GeneXpert® and Cobas® 4800 platforms were used. CD4 quantification was done using the BD FACSCount™ system.

Results: Out of a total of 403 HIV-positive patients, papillomavirus infection was found in 130 (32.3%). Genotypes 16 and 18 represented 33.1% and 15.4%, respectively. Risk factors for HPV infection were a CD4 count < 200 ($p = 0.001$), between 200 and 500 ($p < 0.001$) and a vaginal pH ≥ 5 ($p < 0.001$).

Conclusion: HPV infection is common among HIV (+) women. Several genotypes have been identified. Decreased immunity and increased vaginal pH are factors associated with this infection. Faced with this observation, the prevention of sexually transmitted infections among HIV-positive women appears to be a necessity.

Keywords: Papillomavirus; Precancerous Lesions; Women; HIV; CHU-B

Context

Placed second behind breast cancer in terms of female cancers, cervical cancer was declared a major public health problem by the World Health Organization (WHO) in 2014 [1]. In 2018, its global incidence was estimated at 5,700,000 new cases and its mortality proportion compared to other cancers affecting women was 7.5% [2]. Developing countries bear nearly 80% of global mortality and record the highest prevalence, especially in Africa south of the Sahara [3]. In Burkina Faso, mortality from this cancer is 22.2% and remains among the highest in the world [4].

While a causal link with human papillomavirus (HPV) infection is established [5], the carriage of certain types of papillomas would be significantly associated with cervical intraepithelial neoplasia (CIN) and cervical cancer (CCU) [6]. The power of this association would be weaker for certain types classified as low risk group (LR-HPV) grouping together genotypes 6, 11, 40, 42, 43, 44, 54, 61, 70, 72, 81 and strong for d others reclassified in the so-called high risk group (HR-HPV) with genotypes 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 68, 73 and 82 responsible for the almost all of the cancers recorded, i.e. almost 90% [7]. Currently, only two vaccines are available. The divalent vaccine targeting genotypes 16 and 18 found

in nearly 70% of high-grade lesions and the nonavalent which targets genotypes 6, 11, 31, 33, 45, 52, 58 in addition to the two previous ones. If in northern countries the prevalence and spectra of papilloma infection are well documented, in sub-Saharan Africa the literature remains narrow and indicates significant differences [8]. Particularly infectious factors, especially human immunodeficiency virus (HIV) infection, make it difficult to understand the epidemiology of high-risk papilloma viruses and their respective links with squamous intraepithelial lesions. However, the high prevalence of cervical cancer (15.2% of female cancers) [9] in this part of the world could be explained by the frequency of HIV infection [10] which would modify the natural history of this cancer in people living with HIV by positively regulating the persistence and recurrence of papillomavirus infection as well as the progression to high-grade lesions [11].

It remains more than obvious that the fight against cervical cancer in this part of the world involves primary but also secondary prevention actions for the benefit of populations and through specific type actions for the benefit of people living with HIV, more likely to develop high-grade lesions. UNAIDS, in its 2020 thematic segment on "Cervical cancer and HIV" and certain researchers propose including a primary prevention policy, focused on vaccination, in the care package offered to people living with HIV. young girls 9 yeras and over aged regardless of their serological status. In Burkina Faso, data on the prevalence and spectrum of genital papilloma infection among women living with HIV (FvHIV) are poorly available. However, previous investigations carried out by Sagnan., *et al*. in 2010 [12], Djigma., *et al*. in 2011 [13] in this vulnerable population reported respective prevalences of 58.33% and 59.6% with a predominance of certain genotypes. The factors associated with infection and those associated with intraepithelial lesions, essential for the implementation of effective primary prevention, are also poorly documented. The present study should contribute to a better knowledge of the epidemiology of papillomavirus infection and the factors associated with this infection in women living with HIV with a view to developing joint initiatives to combat HIV and cervical cancer. of the uterus.

Material and Method

Study framework

The study took place in Ouagadougou, precisely at the Bogodogo University Hospital Center (CHU-B). The collection of samples was done in the internal medicine department where people living with HIV receive their care. The various analyzes were carried out at the biomedical analysis laboratory of the said Hospital.

Type and period of study

The study was conducted from August 2021 to February 2023. It was a cross-sectional study with descriptive and analytical aims.

Study population

The study population consisted of patients living with HIV regularly followed in the Internal Medicine department.

Inclusion criteria

Be at least 18 years old; resident in Ouagadougou during the study period; already be on ARV treatment (at least 6 months of treatment); not be pregnant; agree to undergo the entire screening process; be willing to participate in the study after having received all the useful information.

Non-inclusion criteria

Not included were women living with HIV (FvHIV) with a history such as: hemophilia; total hysterectomy; during menstruation at the time of collection.

Sampling and size of the study population

Sampling

Non-probability sampling for convenience. The choice of this method was guided by its simplicity and the advantage of recruiting the maximum number of patients in a center like CHU-B which is one of the references for monitoring people living with HIV in the city of Ouagadougou.

Estimated population size

The size (N) of the estimated population N = 408.55 or 409 FvHIV using the chi2 formula for homogeneity considering the following parameters: Pa: Expected prevalence (i.e. 59.11%) [14.12], Alpha (α): the risk of error of the first type (5%).

$N = Z^2Pa.\ (1\text{-}Pa)\ /\alpha^2 = 368.$

A minimum of 368 FvHIV should be included in the present study.

Considering a rate of non-respondents Nr of 10% N = 408.55 or 409 FvHIV.

Collection of data

As collection tools, a survey sheet was developed for this purpose. Additional information was collected from the Medicine care delivery register. These data were collected using the following

techniques: patient interviews; administration of the survey form; the documentary review (registers, bench notebook).

Collection of biological samples: Cervical cells were collected using a cytobrush inserted into the orifice of the cervix for the detection of HPV. These collected cells were unloaded into a bottle containing a transport and conservation medium (a buffered solution based on 35-55% methanol) Préservcyst ® then carefully closed and stored in a cooler between 4 and 8°C. The secretions collected from the speculum were used to measure vaginal pH using pH paper. In addition, a blood sample was taken on an EDTA tube for quantification of the viral load and CD4 lymphocytes. All of the products collected were sent to the laboratory for specific analyses.

For HR-HPV detection and genotypes, the ceiphed Gene Xpert® platform was used. It is fully automated, on which the HPV test module has been installed. The Ceiphed reaction. This PCR allows the amplification of the E6 and E7 regions of the viral DNA in one hour. It then sends to the interface the results of the analysis indicating the presence of genotypes 16, 18/45 and the other genotypes (31, 33, 35, 52, 58, 51, 59, 39, 56, 66, 68) at high risk in grouped form "others". The validation of the results takes into account the criteria in particular the results of conclusive controls; sterilizations carried out rigorously; and valid reagent lots.

For the quantification of HIV viral load, the Cobas® platform was used. The installed HIV module allows the amplification of HIV nucleic acids by targeting two unique regions of the HIV genome, gag and LTR, which are not subject to selective pressure. Virological failure was assessed in accordance with WHO recommendations, i.e. a viral load greater than 1000 copies/ml after 6 months of ARV treatment [15].

For the quantification of the CD4 count the BD FACSCount™ system was used to quantify the CD4 count. Exclusive expert software automatically identifies the lymphocyte populations of interest according to the principle of flow cytometry.

Ethical considerations

Anonymity and confidentiality were ensured, informed and written consent from patients was obtained in advance as well as written authorization from the general director of the CHUB for carrying out the study within the hospital.

Results

During the study period, we enrolled 403 patients living with HIV regularly followed in the internal medicine departments of CHU-B. The average age of the patients was 41.2 years ± 10.1 years with extremes of 19 years and 67 years.

Prevalence of human papillomavirus infection

- Papillomavirus infection was detected in 130 patients or 32.3%.
- Sociodemographic characteristics of HPV-positive patients

Table 1 presents the distribution of HPV+ patients according to sociodemographic characteristics.

Variables Socio-demographic	HPV (+) N = 130	(%)
Age group		
< 25	5	3.8
[25 - 35[	24	18.5
[35 - 45[	50	38.5
[45 - 55[	38	29.2
≥ 55	13	10
Marital status		
Bride	65	50
Widowed	33	25.4
Single	22	16.9
Divorced	10	7.7
Education status		
None	49	37,7
Primary	36	27,7
Secondary	42	32,3
Academic	3	2,3
Quality of life		
Low	111	85,3
Average	19	14,7
High	0	

Table 1: Distribution of HPV+ patients according to sociodemographic characteristics.

HPV positive patient gynecological and obstetric history

The average age of first sexual intercourse was 18.3 years ± 2.7 years with extremes of 12 years and 40 years.

Among HPV+ patients, 99 or 76.2% had their first sexual intercourse between 15 and 20 years old. Table 2 presents the distribution of HPV+ patients according to gynecological and obstetric history.

Gynecological and obstetric history.	HPV (+)	%
Age of first sexual intercourse		
≤ 15	14	10.8
]15-20]	99	76.2
]20-25]	13	10.0
> 25	4	3.1
Means of contraception		
None	56	43.1
Pills	35	26.9
Condoms	19	14.6
Norplan	12	9.2
Others	7	5.4
IUD	1	0.8
Gesture		
Nulligest	7	5.4
Primigest	25	19.2
Paucigest	55	42.3
Multigesture	43	33.1
Parity		
Nulliparous	26	20.0
Primiparous	39	30.0
Paupiciparous	40	30.8
Multipara	25	19.2
Abortion		
Yes	38	29.2
No	92	70.8

Table 2: Distribution of HPV+ patients according to gynecological and obstetrical history.

HIV type of HPV positive patients

HIV was type 1 for 127 HPV+ patients, i.e. 97.7%, 1.5% of HIV2 and 0.8% of HIV1 and 2 were HPV positive.

CD4 count in patients with HPV

The average CD4 count in HPV+ patients were 466.6/mm^3 ± 263.8 with extremes of 108/mm^3 and 1561/mm^3. Among HPV (+) women, 12 or 9.2% had a CD4 count < 200, 47 or 36.2% those between [200 – 500 [and 71 or 54.6% had a CD4 rate ≥ 500 cel/mm^3.

Quantification of HIV viral load in patients with HPV

For viral load, it was undetectable in 83 HPV+ patients or 63.8% and detectable in 47 patients or 36.2%. Among HPV+ patients, 24 or 18.5% were in virological failure and 106 or 81.5% were not.

Vaginal pH in patients with HPV

The vaginal pH was less than 5 in 23 HPV-positive patients, i.e. 17.7%, and greater than 5 in 107 patients, i.e. 82.3%.

HPV genotypes

In 46 patients carrying HPV, or 35.4%, more than one genotype was identified. Genotype 16 was found in 43 cases or 33.1% and genotype 18 in 12 cases or 15.4%.

Table 3 shows the distribution of HPV genotypes

HPV genotype	Number (N = 130)	Percentage (%)
OTHER HPV	73	56.2
HPV 16/OTHER	27	20.8
HPV 18/OTHER	8	6.2
HPV 16	6	4.6
HPV 16/18/OTHER	5	3.8
HPV 18	5	3.8
HPV 16/45/OTHER	4	3,1
HPV 16/18/45/OTHER	1	0,8
HPV 18/45/OTHER	1	0,8

Table 3: Distribution of patients according to HPV genotypes. HPV (N = 130) (%).

The distribution of HPV genotypes according to the sociodemographic characteristics of the patients is presented in Table 4.

Sociodemographic characteristics	HPV 16 (N = 43)	HPV 18 (N = 20)	HPV 45 (N = 6)	OTHER HPV (N = 118)
Age range				
< 25	2 (4.7)	3 (15)	0 (0)	5 (4.2)
[25 - 35[	5 (11.6)	3 (15)	0 (0)	24 (20.3)
[35 - 45[	20 (46.5)	5 (25)	4 (66.7)	43 (36.4)
[45 - 55[	12 (27.9)	8 (40)	2 (33.3)	33 (28)
≥ 55	4 (9.3)	1 (5)	0 (0)	13 (11)
Marital status				
Bride	21 (48.8)	10 (50)	3 (50)	60 (50.8)
Widowed	13 (30.2)	6 (30)	1 (16.7)	30 (25.4)
Single	7 (16.3)	3 (15)	2 (33.3)	19 (16.1)
Divorced	2 (4.7)	1 (5)	0 (0)	9 (7.6)
Educational level				
None	10	4	0	46
Primary	16	9	3	32
Secondary	16	6	3	38
Academic	1	1	0	2
Quality of life				
Low	35	18	3	101
Medium	8	2	3	17

Table 4: Distribution of patients according to HPV genotypes and sociodemographic characteristics.

Factors associated with papillomavirus infection in Women Living with HIV

In multivariate analysis, no socio-demographic, gynecological and obstetrical factors are associated with HPV carriage among women living with HIV. However, HPV infection is associated with the following: CD4 level < 200 (P = 0.001), [200 - 500 [(P < 0.001), vaginal pH ≥ 5 (P = 0.043).

Discussion

In the present study, the prevalence of high-risk papillomavirus infection among women living with HIV was 32.3%. This high prevalence observed among women living with HIV who were generally on antiretroviral treatment and more than 70% of whom had an undetectable viral load is comparable to that found in other studies such as that reported by Sinayobye., *et al*. [16] in Rwanda in 2014 which was 31.8%. The teams of Djonouma [14] in Mali in 2022 and Menon [17] in Kenya in 2016 observed rates of 40% and 64% respectively. It was even higher in certain countries outside Africa, notably in Romania in 2022 with the team of Cambrea., *et al*. [18], in the United States in 2013 with Remis., *et al*. [19], Brazil in 2021 by Monteiro., *et al*. [20] in and the Antilles in 2019 Abel., *et al*. [21]. In these studies, the prevalences reported were respectively 47.5%; 50.8%; 63.3% and 50.1%. HIV-related immunodeficiency has complex effects on female genital HPV, including increased risks of infection, multiple types, persistence, reactivation, and risk of developing pre-invasive and invasive disease. Replenishment of immunity with antiretroviral drugs improves cellular immunity, but the risk of HPV-related malignancy remains higher than background incidences and presents at younger ages. Early initiation of antiretroviral therapy (ART) allows for better retention of immune memory through existing antibodies and T cell clones and improves long-term outcomes. Suggestions of a higher risk of acquiring HIV if there is genital HPV infection are supported and explained by pathophysiological changes in the cervix, including inflammation [22].

In relation to socio-demographic characteristics, the average age of HPV-positive patients was 42 years, this result is comparable to that reported by Abel., *et al*. [21] in the West Indies in 2019 which was 45 years old. These adult patients are sexually active and therefore run the risk of becoming infected, especially if one of the couple is not faithful to the other. This is all the more correct

since we observed in the present study that 50% of HPV-positive women are not married, therefore prone to living with multiple partners, which is a real risk factor for STIs.

Regarding the HPV genotypes identified, patients with Other HPV genotypes were the most represented with a rate of 56.2%. Studies carried out around the world, notably in Romania in 2022 [18] by Cambrea., *et al.* and in Nigeria in 2013 by the Akarolo-Anthony team [23] reported rates of Other HPV genotypes respectively 89.45% and 88.5%. These results are more important than those observed in the present study. There is heterogeneity in the frequency of HPV genotypes across the different studies carried out on the subject. Indeed, there are more than 50 HPV genotypes that can infect the anogenital sphere out of more than 120 existing ones. Only 18 genotypes are considered to have high oncogenic potential for the cervix, 12 of which are well established. Among these, the 8 genotypes 16, 18, 31, 33, 35, 45, 52 and 58 are involved in 95% of cervical cancers [24]. Genotypes 16 and 18 are responsible for more than 70% of cervical cancers in Western countries [25]. In the present study, the latter two are only represented in 33.1% and 15.4% of cases respectively. These two genotypes are included in the "Gardasil 4" vaccine which protects against HPV 16, 18, 6 and 11. This vaccine, introduced into the Expanded Vaccination Program in Burkina Faso in April 2022, could further contribute to the significant reduction of their prevalence.

Among the factors associated with HPV infection in women living with HIV, the CD4 count < 200 and that between 200 and 500 increased the risk of having HPV infection by 20.22 and 13.79, respectively. by being infected with HIV. This result is observed in other works, notably those carried out in Rwanda in 2014 by Sinayobye., *et al*. [16] who also showed that HPV was associated with a CD4 count <200 cells. The same is true in the study conducted in Brazil in 2014 by Rocha-Brischiliari., *et al.* [26] who reported that women with a CD4 count between 200 and 350 cells/mm^3 had a twice as high risk of infection. by HPV than those with more than 350 cells/mm^3. The fact that immunological features observed during HPV infection overlap with cellular and molecular pathways known to increase susceptibility to HIV highlights the potential interaction between these two viral infections that fuels their mutual spread [27]. Taking into account the natural history of HPV, there is an incomplete reconstitution of the immune response to HPV with antiretroviral therapy. Antiretroviral treatment itself was not an independent predictor of Hr-HPV prevalence, but its effects were likely mediated by CD4 count. Thus, the decline in immunity would be associated with a reactivation of latent HPV infection, or with the acquisition of new infections [28]. HIV-positive individuals who have reduced CD4+ T cell counts are susceptible to multiple HPV infections, prolonged viral persistence, and increased risk of cervical neoplasia [27]. Vaginal pH ≥ 5 increased the risk of having an HPV infection by 1.86. Elevated vaginal pH is linked to genital tract inflammation and changes in bacterial flora, two cofactors suggested for the persistence of HPV infection [29]. An elevation in vaginal pH has been shown to be associated with a loss of natural epithelial defenses and an increased rate of colonization of the vagina and urinary tract by pathogens [30].

Conclusion

This study shows that HPV infection is common among women living with HIV. Several genotypes have been identified but the most common are not included in the current EPI vaccine.

Decreased immunity and inflammation of the genital tract translated by an increase in vaginal pH are the factors associated with HPV infection while the latter is the main risk factor for cervical lesions. Faced with this observation, the prevention of sexually transmitted infections among HIV-positive women appears to be a necessity.

Bibliography

1. World Health Organization. Human papillomavirus vaccines: WHO position paper, 2014. Weekly Epidemiology Record 89.43 (2014): 465-491.

2. World Health Organization. Cervical cancer; (2022).

3. Alliance of French-speaking African and Mediterranean Leagues against cancer. Cervical cancer. Cancers in French-speaking Africa. Paris: National League Against Cancer (2017): 46-49.

4. Burkina Faso profile for cervical cancer. World Health Organization - Country profiles for cervical cancer (2021).

5. Bowden SJ., *et al*. "Human papillomavirus". *Obstetrics, Gynaecology and Reproductive Medicine* 30.4 (2020): 109-118.

6. Chan CK., *et al*. "Human papillomavirus infection and cervical cancer: epidemiology, screening, and vaccination - review of current perspectives". *Journal of Oncology* (2019): e3257939:11.

7. Bzhalava D., *et al*. "International standardization and classification of human papillomavirus types". *Virology* 476 (2015): 341-314.

8. Ruelle Y and Fiquet L. "HPV detection tests in cervical cancer screening". *Exercise* 27.123 (2016): 24-33.

9. Cissé ML. "Cervical cancer: epidemiology - natural history". Dakar: Cheikh Anta Diop University (2011).

10. World Health Organization. "Cervical cancer in the WHO African region: current situation and outlook". Geneva: WHO (2010): 1-6.

11. Berrébi A., *et al*. "Frequency, persistence and recurrence of HPV lesions of the cervix in HIV-positive patients". *Gynecologie, Obstetrique and Fertilite* 36.5 (2008): 521-524.

12. Sagna T., *et al*. "Human papillomaviruses prevalence and genital co-infections in HIV-seropositive women in Ouagadougou (Burkina Faso)". *Pakistan Journal of Biological Sciences* 13.19 (2010): 951-955.

13. Djigma FW., *et al*. "Prevalence and genotype characterization of Human Papillomaviruses among HIV-seropositive in Ouagadougou, Burkina Faso". *Acta Tropica* 117.3 (2011): 202-206.

14. Djonouma I. "Human papillomavirus typing in cervical cancer screening in HIV-positive women tives in Bamako, Med Thesis: University of Sciences, Techniques and Technologies of Bamako" (2023).

15. World Health Organization. "HIV management: latest information on treatment monitoring: measurement of viral load and CD4 cell count". Geneva: WHO (2017): 1-2.

16. Sinayobye J A., *et al*. "Prevalence and risk factors for High-Risk Human Papillomavirus (hrHPV) infection among HIV-infected and Uninfected Rwandan women: implications for hrHPV-based screening in Rwanda". *Infectious Agents Cancer* 9.1 (2014): 40.

17. Menon S., *et al*. "Epidemiology of HPV genotypes among HIV positive women in Kenya: a systematic review and meta-analysis". *PLoS One* 11.10 (2016): e0163965.

18. Cambrea SC., *et al*. "HPV and HIV coinfection in women from a southeast region of Romania-PICOPIV study". *Medicine* 58.6 (2022): 760.

19. Remis RS., *et al*. "The epidemiology of sexually transmitted co-infections in HIV-positive and HIV-negative African-Caribbean women in Toronto". *BMC Infectious Disease* 13 (2013): 550.

20. Monteiro JC., *et al*. "Prevalence of high risk HPV in HIV-infected women from belém, pará, amazon region of Brazil: a cross-sectional study". *Frontiers in Public Health* 9 (2021): 649152.

21. Abel S., *et al*. "High prevalence of human papillomavirus infection in HIV-infected women living in French Antilles and French Guiana". *PloS One* 14.9 (2019): e0221334.

22. Dreyer G. "Clinical implications of the interaction between HPV and HIV infections". *Best Practice and Research Clinical Obstetrics and Gynaecology* 47 (2018): 95-106.

23. Akarolo-Anthony SN., *et al*. "HIV associated high-risk HPV infection among Nigerian women". *BMC Infectious Disease* 13 (2013): 521.

24. Ferlay J., *et al*. "Estimates of worldwide burden of cancer in 2008: Globocan 2008". *International Journal of Cancer* 127.12 (2010): 2893-2917.

25. Clifford G., *et al*. "HPV type-distribution in women with and without cervical neoplastic diseases". *Vaccinated* 24.3 (2006): 26-34.

26. Rocha-Brischiliari SC., *et al*. "Risk factors for cervical HPV infection and genotypes distribution in HIV-infected South Brazilian women". *Infectious Agents Cancer* 9.1 (2014): 6.

27. Zayats R., *et al*. "HPV and the Risk of HIV acquisition in women". *Frontiers in Cellular and Infection Microbiology* 12 (2022): 1-11.

28. Liu G., *et al*. "HIV-positive women have higher risk of HPV infection, precancerous lesions, and cervical cancer: a systematic review and meta-analysis". *AIDS* 32.6 (2018): 795-808.

29. Mitra A., *et al*. "The vaginal microbiota, human papillomavirus infection and cervical intraepithelial neoplasia: what do we know and where are we going next?" *Microbiome* 4 (2016): 58.

30. Clarke MA., *et al*. "A large, population-based study of age-related associations between vaginal pH and human papillomavirus infection". *BMC Infectious Disease* 12 (2012): 33.