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RESEARCH ARTICLE

SCREENING FOR PRECANCEROUS AND CANCEROUS LESIONS IN HIV-POSITIVE WOMEN AT THE REGIONAL HOSPITAL OF BAFOUSSAM, CAMEROON

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Abstract

Background: Cervical cancer is one of the most frequent and severe cancers among women worldwide. In this context, screening programs targeting HIV-positive women have been implemented in developing countries, including Cameroon. However, there is a lack of data on the prevalence and determinants of precancerous lesions in HIV-positive women in the Western Region. The aim of this study was to assess the impact of screening for precancerous and cancerous lesions in HIV-positive women at the Regional Hospital of Bafoussam.

Methods: Over a four-week period, 104 sexually active HIV-positive women receiving antiretroviral therapy (ART) were followed at the Regional Hospital of Bafoussam. Cervico-vaginal samples were taken and stained using the Papanicolaou technique after collecting various study-related information. The data were analyzed using Microsoft Excel 2019, and the distribution of variables was studied using descriptive statistics through SPSS 21.0 software. The chi-square (χ^2) test was used to assess the relationship between risk factors for cervical cancer and the occurrence of precancerous lesions.

Results: Cytological analysis of the 104 women showed that 90.38% had normal smears, 7.69% had low-grade squamous intraepithelial lesions (LSIL), and 1.9% had high-grade squamous intraepithelial lesions (HSIL). Precancerous lesions were observed in 19.23% of women with an undetectable viral load and 7.14% of those with a viral load > 40 copies/ml. These lesions primarily affected women who had been on antiretroviral therapy for at least one year. The majority of lesions were found in women aged 31 to 65 years, with a peak in the 51-65 age group. Factors associated with a higher frequency of lesions **included**: 21.43% of women who had their first sexual intercourse before the age of 15, 14.28% of women with high parity, and 11.62% of married women.

Conclusion:The prevalence of precancerous lesions is high among HIV-positive women, putting them at an increased risk of developing cervical cancer if they do not receive proper therapeutic follow-up.

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Introduction:-

Human papillomavirus (HPV) infections are among the most widespread viral infections globally. With an incidence exceeding 30 million cases annually, HPV infection is likely the most common sexually transmitted infection worldwide (Scheurer et al., 2005). Cervical cancer is directly linked to high-risk HPV infections (HPV-HR) affecting the exocervical mucosa (Subramanya et al., 2008). The majority of women are exposed to HPV very early, often as soon as they begin sexual activity (Seck et al., 1994).

Early screening is a crucial measure to prevent this pathology, as precancerous lesions appear and become detectable between 10 and 15 years after the primary infection by this oncogenic virus. HPV is responsible for about 70% of cervical cancers, with 50% attributed to the most virulent strain, HPV 16, and 10-15% to HPV 18. Globally, approximately 2.3 million women are affected by this disease, with an annual incidence of 528,000 new cases and a mortality of 266,000 deaths per year. Cervical cancer is thus the second most common cancer among women worldwide (Ferlay et al., 2015).

HPV-HR infections are nearly five times more common in women living with HIV (Denny et al., 2012). These women also have a 40 times higher risk of developing high-grade intraepithelial lesions and a 2 to 22 times higher likelihood of developing invasive cervical cancer compared to HIV-negative women (Looker et al., 2015).

Economically, the impact of cervical cancer is particularly significant in low-resource countries. Among all cancers, it is responsible for nearly 2.4 million years of life lost in women aged 15-59 years, accounting for 22% of the years of life lost due to cancer in low-resource countries, 10% in middle-income countries, and 5% in developed countries (WHO, 2015). According to the World Health Organization (WHO), cervical cancer is expected to cause over 443,000 deaths annually by 2030, with more than 98% of these deaths occurring in developing countries, and 90% concentrated in sub-Saharan Africa.

The increasing incidence of cervical cancer, particularly in Africa, threatens the progress made in improving the survival and longevity of African women. Over the past decade, access to antiretrovirals has expanded significantly. By 2014, more than 15.8 million people worldwide were receiving antiretroviral treatment. This large-scale deployment has led to a significant improvement in the survival of people living with HIV, including in low-resource countries (Toure et al., 2008).

However, this increase in survival may be accompanied by an epidemiological transition marked by increased morbidity related to chronic diseases such as cancer, as observed in industrialized countries. Despite the progress made in therapeutic coverage and follow-up, HIV-infected patients remain a vulnerable population requiring long-term care.

As the incidence of HIV continues to rise in many countries, cervical cancer is likely to claim even more lives. Cameroon is no exception to this trend: the HIV prevalence rate rose from 0.5% in 1987 to 11.8% in 2003, and then to 4.3% in 2011, with a higher prevalence in women (5.6%) than in men (2.9%) (UNICEF. HIV/AIDS and Malaria, 2003).

Methodology

To conduct our study, we followed the approach outlined below:

Communication to Encourage Women to Participate in Screening

We conducted an awareness campaign at the antiretroviral care center of the Regional Hospital of Bafoussam during the research period. This campaign focused on cervical cancer in general, with particular emphasis on individuals living with HIV/AIDS. The importance of screening was explained to women attending consultations or collecting their medication.

Interviews with Patients

Women who consented to the screening signed a form:

• An informed consent form for participants aged 21 to 65.

• An assent form for participants aged 18 to 20.

Then, they answered a questionnaire designed to guide the interview. They were also provided with objective information about precancerous and cancerous cervical lesions, and any concerns they had were addressed if necessary.

Cervico-Vaginal Smear (CVS)

The sampling procedure followed these steps:

Preparation of Materials:
• Each patient was assigned a unique code, which was written on the slides with the indication of the sampling site.
Preparation of the Patient:
• The patient was directed to the sampling room after being informed about the necessary conditions for the collection.
• She was then positioned in a gynecological position on an appropriate bed.
Sampling:
• A speculum was placed to expose the cervix.
• Using an Ayre spatula, a sample from the exocervix was collected by gently scraping the mucosa and spreading it in a single layer on the first slide.
• A cytobrush was used to collect the endocervix through a circular motion (clockwise), and the sample was spread on a second slide.
• The slides were immediately fixed using a fixative spray and stored in a sealed box.
Staining and Analysis:
• The slides were stained at the laboratory of the Evangelical University of Cameroon in Mbouo, using the Papanicolaou technique.
• A first reading of the slides was performed, and a report was generated. This was confirmed by an anatomopathologist, for which we used a LEICA DM 1000 optical microscope.
Communication of Results:
• Patients returned to the hospital to collect their results. Those requiring diagnostic or therapeutic management were referred to a gynecologist.

Data Analysis

The collected data were processed as follows:The data were entered into a Microsoft Excel 2019 database for storage, statistical analysis, and the creation of graphs and diagrams.IBM/SPSS version 21.0 software was used for statistical analysis.The chi-square test (χ^2) was used to compare variables. A p-value of < 0.05 was considered statistically significant.

Ethical Considerations

We obtained collection authorization for the pre-analytic and post-analytic phases on May 15, 2020, from the Director of the Regional Hospital of Bafoussam, as well as from the Faculty of Science and Technology of the Evangelical University Institute for the analytic phase conducted in the anatomopathology laboratory of this institute. These authorizations enabled the implementation of this study.
Furthermore, we obtained ethical clearance from the National Committee for Ethics in Human Health Research (CNERSH), reference N 2020/07/1276/CE/CNERSH/SP. An informed consent form was provided to each participant, ensuring voluntary and informed participation. Data confidentiality was ensured through a coding system for participants' information, thereby protecting their anonymity during and after the study.
Quality Control
The evaluation of smear quality is a crucial element in ensuring the reliability of results, in accordance with the Bethesda classification system (2014 version). This system is recommended for assessing the interpretability of cervico-vaginal smears. The quality evaluation occurs in two phases:

1. Pre-Analytic Phase: Quality of the Sample
   This phase considers the following factors:
   • Insufficient clinical information, limiting the reliability of interpretation.
   • Incorrect labeling of slides, leading to identification errors.
   • Damaged slides, compromising their readability.
   • Dirty slides, preventing accurate observation.
   • Other similar factors that may impair the quality of the sample.
2. Analytic Phase: Cellular Composition and Interpretability

   A smear is considered non-interpretable if any of the following criteria are observed:

   • Poor staining of cells.

- Poor slide mounting.
- Cell overlap due to improper spreading.
- Absence of endocervical cells.
- Obscurity affecting more than 75% of the cells due to the presence of blood.
- Less than 10% of the slide covered by squamous cells.
- Excessive inflammation.
- Poor fixation of samples.

These quality criteria are essential to ensure the validity of the results obtained and their proper interpretation.

Results

A. Description of Socio-Demographic Characteristics

The description of the socio-demographic characteristics of our study shows that: The average age of the patients in our study was 42.84 ± 10.30 years, with a minimum age of 21 years and a maximum of 63 years. The most represented age groups were 31 to 40 years (30.77%), followed by 50 years and above (33.65%). In terms of marital status, most women in our study were married, accounting for 41%, followed by widows at 25%, single women at 29%, and finally, divorced women at 5%. Additionally, these women worked in various professions, with housewives being the most represented group, making up 48.1% (50 individuals). Regarding their sexual activity, based on the number of sexual partners, the majority of women had only one partner during the period of our study, accounting for 86.54%. The table below (Table 1) summarizes these socio-demographic characteristics.

Table 1: Description of Socio-Demographic Characteristics

Variable	Frequency	Percentage
Age distribution of participants 42.84 ± 10.30		
21 -30 years	11	10.58
31 -40 years	32	30.77
41 – 50 years	26	25.0
50 years and older	35	33.65
Marital status		
Single	30.16	29
Divorced	5.2	5
Married	42.64	41
Widowed	26	25
Socio – professional categories		
Maintenace worker	1	1
Cashiers	1	1
Hairdressers	3	2.9
Traders	18	17.3
Seamstresses	5	4.8
Farmers	6	5.8
Teachers	8	7.7
Students	3	2.9
Nurses	11	10
IT Specialists	11	11
Housewives	50	48.1

Military	1	1
Musicians	1	1
Retirees	4	3.8
Unemployed	1	1
Distribution of participants by number of sexual partners		
0 partners	9	8.65
1 partner	90	86.53
2 partners	4	3.85
5 partners	1	0.96

B- Evaluation of the Knowledge Level of HIV-Positive Women on Cervical Cancer

As shown in Table 2 below, the vast majority of women in our study population, 91.35%, had never heard of cervical cancer. Additionally, 95% of these women were undergoing their first cervical cancer screening.

Table 2:Evaluation of the Knowledge Level of HIV-Positive Women on Cervical Cancer

Variable	Sample size	Frequency
Knowledge of women about cervical cancer, screening, and prevention methods		
Yes	9	8.65%
No	99	91.35%
First screening for cervical cancer		
Yes	9	8.65%
No	95	91.35%

C- Description of Clinical and Gynecological-Obstetric Data

The average age at first sexual intercourse for the women in our study was 17.79 ± 2.01; the highest number of women was in the age group of 15–18 years, representing 54.80%. Furthermore, regarding parity, most women in our study were multiparous, accounting for 66%. The majority of these women in our study used condoms as a contraceptive method, representing 92.3%, or 96 women. The speculum clinical examination revealed that, according to the figure, most women had a normal cervix, accounting for 78.8%, or 82 women.

Table 3: Description of Clinical and Gynecological-Obstetric Data

Variable	Sample size	PERCENTAGE
Distribution of participants based on age at first sexual intercourse		
Less than 15 years	14	13.46
15-18 years	57	54.80
19-22 years	33	31.73
Parity		
Nulliparous (no children)	8	7.7
Primiparous (One child)	6	5.8
Multiparous (Multiple children)	69	66.3
Grand multiparous (many children)	21	20.2

Distribution of participants based on contraception methods		
Abstinence	3	2.88
Norplant (Implant)	3	2.88
Condom (preservative)	96	92.30
Oral contraceptive pill	2	1.92
Distribution of participants based on cervical macroscopic findings		
Normal	82	78.85
Hermorrhagic	7	6.73
Inflammatory	9	8.65
Polyps	1	0.96
Bleeding on contact	5	4.81

D - Data related to HIV

The viral load values of the women in our study mostly had a normal viral load value, i.e., less than 40 copies/µl, accounting for 61.5%, while 13.5% had a viral load greater than 40 copies/µl, and 25% of our participants were waiting for their viral load results.

Duration of antiretroviral treatment

The majority of the women in our study had been on antiretroviral treatment for at least 10 years, representing 52%, and 48% had been on treatment for more than 10 years. Among the three lines of treatment available in Cameroon, 88% of the patients who participated in our study were on the first line of antiretroviral therapy, compared to 12% who were on the second line. This is summarized in the table 3 below

Table 3: HIV-Related Data

Variable	Frequency	Percentage
Viral load value		
Awaiting results	26	25
Less than or equal to 40copies/ml	64	61.5
Greater than 40copies /ml	14	13.5
Distribution of participants based on ARV duration		
Less than or equal to 6 months	2	1.9
6 months – 5 years	11	10.6
5 (10 years	41	39.4
More than 10years	10	48.1
Distribution of participants based on ARV regimen		
First line	92	88.5
Second line	12	11.5

E- Profile of the results of our participants

The cytological study of the cervical smear of the 104 HIV-positive patients included in our study shows that 91.3% had a normal smear; 6.7% had low-grade intraepithelial lesions (LSIL), and 1.9% had high-grade intraepithelial lesions (HSIL). As shown in Table 4 below.

Table 4: Results of the FCV of our study

Variable	Frequency	Percentage
Normal	95	91.3
L-SIL	7	6.7
H-SIL	2	1.9

F- Analysis of Risk Factors Likely to Affect the Prevalence of Precancerous Lesions

Cytological Abnormalities and Marital Status

The prevalence of precancerous lesions was higher in divorced women at 20% compared to married women at 11.62% (HSIL 2.32% and LSIL 9.30%), widows at 11.54% (HSIL 3.85% and LSIL 7.69%), and single women at 3.33%.

Cytological Abnormalities and Age Group

The prevalence of precancerous lesions in the 50 years and older age group was 17.13% (HSIL 5.71% and LSIL 11.42%). In the 41 to 50 years age group, it was 7.69% LSIL,

compared to 6.25% LSIL in the 31 to 40 years age group (see Table 4). The Chi-squared test showed a P-value < 0.05, indicating that age was statistically significant in the appearance of precancerous lesions.

Cytological Abnormalities and Number of Sexual Partners

The prevalence of lesions was 25% (HSIL) in women with two sexual partners, and 9.99% (HSIL 1.11% and LSIL 8.88%) in women who had only one sexual partner.

Cytological Abnormalities and Age at First Sexual Intercourse

The prevalence was higher in women who had their first sexual intercourse before the age of 15, at 21.43% (HSIL 14.29% and LSIL 7.14%). It was 8.77% LSIL for those who had their first sexual intercourse between 15 and 18 years, and 6.06% LSIL for those who had their first sexual intercourse between 19 and 22 years.

Cytological Abnormalities and Parity

The prevalence was 14.28% (HSIL 9.52% and LSIL 4.76%) in women with high parity, and 10.14% in women with multiple pregnancies.

Cytological Abnormalities and Contraceptive Use

33.33% of precancerous lesions were found in patients who did not use any contraceptive methods.

Cytological Abnormalities and Viral Load

The prevalence of precancerous lesions was high at 19.23% (LSIL 15.38% and HSIL 3.85%) in women awaiting their viral load results. It was 14.28% (LSIL 7.14% and HSIL 7.14%) in women with a viral load greater than or equal to 40 copies/µl, and 4.67% (LSIL) in womenwith a viral load of less than 40 copies/µl.

Table 5: Analysis of Risk Factors Likely to Affect the Prevalence of Precancerous Lesions

Variable	Category				P-Value
Cytological Abnormalities and Marital Status					
STATUS	Normal	LSIL	HSIL	TOTAL	0.189
Single	29	1	0	30	
Divorced	4	1	0	5	
Married	38	4	1	43	
Widowed	23	2	1	26	
Total	94	8	2	104	
Cytological abnormalities and age group					
Age	Normal	LSIL	HSIL	TOTAL	0.042
21- 30 years	11	0	0	11	
31- 40 years	30	2	0	32	
41-50 years	24	2	0	26	
>50 years	29	4	2	35	
Total	94	8	2	104	
Cytological abnormalities and number of sexual partners					
	Normal	LSIL	HSIL	TOTAL	0.231
0	9	0	0	9	
1	81	8	1	90	
2	3	0	1	4	
5	1	0	0	1	
Total	95	2	2	104	
Cytological abnormalities and age at first sexual intercourse					
	Normal	LSIL	HSIL	TOTAL	0.521
<15 years	11	1	2	14	
15 – 18 years	52	5	0	57	
19 – 22 years	31	2	0	33	
Total	94	8	2	104	
Cytological abnormalities and parity					
	Normal	LSIL	HSIL	TOTAL	0.574
Nulliparous	8	0	0	8	
Primiparous	6	0	0	6	
Multiparous	64	7	0	69	
Grand multiparous	18	1	2	21	
Total	94	8	2	104	
Cytological abnormalities and contraceptive use					
	Normal	LSIL	HSIL	TOTAL	0.258
Abstinence	2	1	0	3	
Norplant	3	0	0	3	
Condom	87	7	2	96	
Pill	2	0	0	2	
Total	94	8	2	104	
Cytological abnormalities and viral load					
	Normal	LSIL	HSIL	TOTAL	0.627
Awaiting results (copies/ml)	21	4	1	26	
<40	61	3	0	64	
> 40	12	1	1	14	
Total	94	8	2	104	

Discussion.

B.1 Prevalence of Precancerous Lesions

This descriptive study, conducted with 104 patients living with HIV at the Regional Hospital of Bafoussam, estimated the prevalence of precancerous cervical lesions at 9.6%, primarily consisting of low-grade intraepithelial lesions (LSIL = 7.7%). This rate is significantly higher compared to previous studies in Cameroon, such as Nkegoum's (2001) study in Yaoundé and Douala, which reported 7%, or Tebeu's (2005) study in Bali, a rural area, which estimated the prevalence at 7.9%.

For comparison, developed countries report much lower prevalences, including less than 1% in France (Raffle et al., 1995) and 1.6% in the United States (Disaia et al., 1993). These differences can be explained by:

- A targeted population: women living with HIV, where immunosuppression favors the onset of precancerous lesions.
- The exclusive use of cytology, whose diagnostic performance and reproducibility remain limited.
- Low screening uptake: 92% of the women in the study had never had a smear test. This highlights the importance of organizing awareness and screening campaigns in remote areas like Bafoussam.

The predominance of low-grade lesions (7.7%) is alarming because these lesions can progress to high-grade forms or invasive cancer.

B.2 Precancerous Lesions and Age Group

The average age of the studied patients was 42.84 ± 10.30 years, a value close to that reported by Kemfang et al. (2015) in Cameroon (41 ± 10.6 years). Precancerous lesions were found across all age groups, but the prevalence significantly increased in women over 50 years old:

- Age group 51–65 years: 17.13% (HSIL = 5.71%, LSIL = 11.42%).
- Age group 41–50 years: 7.69% (LSIL).
- Age group 31–40 years: 6.25% (LSIL).

These results confirm a trend toward younger age for the appearance of precancerous lesions, justifying a revision of recommendations on the start and end age for screening. Our study shows a significant association between age and cytological abnormalities ($p < 0.05$).

B.3 Precancerous Lesions and Age at First Sexual Intercourse

The average age at first sexual intercourse was 17.79 ± 2.01 years, with extremes ranging from 12 to 22 years. The most represented age group was 15–18 years (54.40%). The prevalence of precancerous lesions was higher in women who had sexual intercourse before the age of 15 (21.43%, HSIL = 14.28%, LSIL = 7.14%). This early onset could be linked to:

- Early curiosity and sociocultural factors, as highlighted by Rwenge (1999, 2000) in Bamenda.
- Socioeconomic pressures in developing countries, where young girls engage in sexual activity early.

These results confirm that early sexual intercourse is a significant risk factor in the development of precancerous cervical lesions.

B.4 Precancerous Lesions and Parity

We observed a prevalence of 10.14% of precancerous lesions among multiparous women, which aligns with previous studies (Hanske et al., 2016, Muñoz et al., 2002). Multiparity is a known risk factor for cervical cancer. However, no statistically significant relationship could be established in our study, likely due to the limited representativeness of the sample.

B.5 Precancerous Lesions and Viral Load

Patients with higher viral loads had a higher prevalence of precancerous lesions:

- Undetermined viral load: 19.23%.
- Viral load > 40 copies/mL: 14.28%.
- Viral load ≤ 40 copies/mL: 4.67%.

These observations are consistent with African and international studies identifying severe immunosuppression as a major factor in cytological abnormalities (Agaba et al., 2004, Ahdieh-Grant et al., 2004). However, no statistically significant relationship was established in our study.

B.6 Antiretroviral Treatments and Precancerous Lesions

The prevalence of precancerous lesions was higher among women who had been on antiretroviral treatment for less than a year (26.12%, HSIL = 6.9%, LSIL = 19.22%). Several hypotheses may explain this observation:

- Immune reconstitution favoring the elimination of oncogenic HPV due to treatment.
- A prolonged life expectancy allowing the progression of persistent infections.

Previous studies, such as Minkoff et al. (2001), have shown that women on antiretroviral treatment were more likely to see their precancerous lesions regress. However, our study did not establish a statistically significant link between the duration of treatment and precancerous lesions, likely due to the small sample size.

Conclusion.

The primary objective of our study was to contribute to the fight against cervical cancer and strengthen the prevention of this disease in Cameroon, particularly in the Western region. To achieve this, we collected samples from 104 women living with HIV, stained them using the Papanicolaou technique, and then analyzed them.
The main findings of the study show:

- A prevalence of 9.6% for precancerous lesions of the cervix, with a predominance of low-grade intraepithelial lesions (LSIL = 7.7%).
- Normal smears in 90.4% of cases.
- Among the factors studied, only the age of the patients was statistically associated with the occurrence of precancerous lesions ($p < 0.05$).

However, we observed concerning trends:

- A higher frequency of precancerous lesions among patients:
  - Awaiting results on their viral load.
  - With a detectable viral load (> 40 copies/mL).
  - Who had been on antiretroviral treatment for less than a year.
- Married and multiparous women also appeared to be more frequently affected.

These results highlight that women living with HIV, without adequate therapeutic follow-up, are particularly at risk of developing cervical cancer.
Recommendations
To reduce the incidence of this pathology, we propose the following actions:

1. Strengthen systematic and early screening for precancerous lesions, particularly among at-risk populations.
2. Raise awareness among women living with HIV about the importance of regular consultations and smear tests for screening.
3. Extend screening campaigns to all regions, particularly rural areas.
4. Promote rigorous therapeutic follow-up and optimal viral load management among women on antiretroviral treatment.
5. Encourage vaccination against human papillomavirus (HPV) in young girls.

Our study emphasizes the urgency of these measures to prevent the progression of precancerous lesions to invasive cancer, which remains a major threat to women living with HIV.

Bibliographic References

1. Bratcher L.F., Sahasrabuddhe V.V. The Impact of Antiretroviral Therapy on HPV and Cervical Intraepithelial Neoplasia: Current Evidence and Directions for Future Research. *Infectious Agents and Cancer*, 5(1), 2010, Article 8.
2. Castellsagué X., Bosch F.X., Muñoz N., et al. HPV and Cervical Cancer in the World 2007 Report. *Vaccine*, 25(Suppl 3), 2007, pp. C1-C230.
3. deSanjosé S. Epidemiology of cancers: HPV and cervical cancer. INAS, 2008.
4. Del Mistro A., Bertorelle R., Franzetti M., et al. Antiretroviral Therapy and the Clinical Evolution of Human Papillomavirus-Associated Genital Lesions in HIV-Positive Women. *Clinical Infectious Diseases*, 38(5), 2004, pp. 737-742.
5. Firnhaber C., Van Le H., Pettifor A., et al. Association Between Cervical Dysplasia and Human Papillomavirus in HIV-Seropositive Women From Johannesburg, South Africa. *Cancer Causes & Control*, 21(3), 2010, pp. 433-443.

6. Gallagher B., Wang Z., Schymura M.J., Kahn A., Fordyce E.J. Cancer Incidence in New York State Acquired Immunodeficiency Syndrome Patients. *American Journal of Epidemiology*, 154(6), 2001, pp. 544-556.
7. Guiguet M., Boué F., Cadranel J., et al. Effect of Immunodeficiency, HIV Viral Load, and Antiretroviral Therapy on the Risk of Individual Malignancies (FHDH-ANRS CO4): A Prospective Cohort Study. *The Lancet Oncology*, 10(12), 2009, pp. 1152-1159.
8. Koss L.G., Leopold G., et al. The Papanicolaou smear for cervical cancer screening: A victory and a tragedy. *JAMA*, Gynecology Supplement, 14(184), 1989, pp. 15-27.
9. Maiman M., Fruchter R.G., Serur E., et al. Human Immunodeficiency Virus Infection and Cervical Neoplasia. *Gynecologic Oncology*, 38(3), 1990, pp. 377-382.
10. Massad L.S., Seaberg E.C., Watts D.H., et al. Long-Term Incidence of Cervical Cancer in Women with Human Immunodeficiency Virus. *Cancer*, 115(3), 2009, pp. 524-530.
11. Mbulaiteye S.M., Katabira E.T., Wabinga H., et al. Spectrum of Cancers Among HIV-Infected Persons in Africa: The Uganda AIDS-Cancer Registry Match Study. *International Journal of Cancer*, 118, 2006, pp. 985-990.
12. Minkoff H., Ahdieh L., Massad L.S., et al. The Effect of Highly Active Antiretroviral Therapy on Cervical Cytologic Changes Associated with Oncogenic HPV Among HIV-Infected Women. *AIDS*, 15(16), 2001, pp. 2157-2164.
13. Morlat P. Medical management of people living with HIV: recommendations from the expert group. 2013 report, under the direction of Professor Philippe Morlat and the sponsorship of the CNS and ARNS. Available at: http://socialsante.gouv.fr/IMG/pdf/Rapport_Morlat_2013_Mise_en_ligne.pdf.
14. Muñoz N., Castellsagué X., de González A.B., Gissmann L. Chapter 1: HPV in the Etiology of Human Cancer. *Vaccine*, 24(Suppl 3), 2006, pp. S1-S10.
15. Muñoz N., Franceschi S., Bosetti C., et al. Role of Parity and Human Papillomavirus in Cervical Cancer. *The Lancet*, 359, 2002, pp. 1093-1101.
16. Nkegoum B., Priso E.B., Mbakop A. Precancerous Lesions of the Uterine Cervix in Cameroonian Women: Cytological and Epidemiological Aspects of 946 Cases. *GynecologieObstetrique&Fertilité*, 29(1), 2001, pp. 15-20.
17. Serraino D., Dal Maso L., Franceschi S. Invasive Cervical Cancer as an AIDS-Defining Illness in Europe. *AIDS*, 16(5), 2002, pp. 781-786.
18. Spano J.P., Marcelin A.G., Carcelin G. Cancer and Papillomavirus. *Bulletin du Cancer*, 92(1), 2005, pp. 59-64.
19. WHO, Ministry of Health of the Kingdom of Morocco, Lalla Salma Association for the Fight Against Cancer. Early Detection Guide for Breast and Cervical Cancer. 2011 Edition.
20. WHO. Fighting Cervical Cancer: Essential Practices Guide. 1st edition, Geneva, 2007, p. 41.