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Seroprevalence and Risk Factors for *Chlamydia Trachomatis* Infection among HIV-AIDS Positive Women in the Soa District Hospital, Cameroon

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Abstract

Background: *Chlamydia trachomatis* infection is the most common bacterial sexually transmitted infection (STI) globally. A high prevalence of *C. trachomatis* has been consistently reported among people living with HIV/AIDS. This study aimed to determine the seroprevalence and identify risk factors for *C. trachomatis* infection in women living with HIV/AIDS.

Methods: We conducted a cross-sectional study involving 80 women living with HIV/AIDS. Data on socio-demographic characteristics and intravaginal practices were collected using a structured questionnaire. Serological testing for anti-*Chlamydia trachomatis* IgG and IgM antibodies was performed using an enzyme-linked immunosorbent assay (ELISA).

Results: The overall seroprevalence of *Chlamydia trachomatis* infection was 50%. The highest prevalence was observed in the 30-40 years age group (18.75%). A lower prevalence of infection was associated with higher education; women with a university education had a prevalence of 8.75%. Intravaginal practices were identified as a significant risk factor, with 32.5% of infected women reporting this practice.

Conclusion: The high seroprevalence of *Chlamydia trachomatis* in this cohort suggests that HIV infection increases the risk of co-infection. We recommend that women living with HIV/AIDS undergo regular screening for other sexually transmitted infections, particularly *C. trachomatis*.

Keywords: Chlamydia trachomatis infection; Intravaginal practices; Education level; Women; Cameroon

Introduction

Current health guidelines from HIV/AIDS care units recommend screening for gonorrhea and *Chlamydia trachomatis* infection in sexually active, HIV-positive individuals at least once a year [1-2]. Numerous studies have shown that Chlamydia trachomatis infection is more prevalent in HIV/AIDS-infected patients than in non-infected individuals [3-4]. Bhattar et al. reported a prevalence of Chlamydia trachomatis infection of 6.67% and 1.67% in HIV-positive and HIV-negative women, respectively [3]. Chaisilwattana et al. reported similar findings, with 16.2% in HIV/AIDS-infected women and 9.1% in non-infected women [4]. Other studies have revealed that people living with HIV/AIDS are at high risk of acquiring other sexually transmitted infections [5-6]. Ninety percent of sexually transmitted infections occur in developing countries, and much research has shown a synergistic relationship between HIV/AIDS and other STIs [7]. Chlamydia trachomatis

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infection and gonorrhea are among the most common curable STIs worldwide, with 127 million and 86.9 million new cases occurring each year, respectively [7]. These two STIs are associated with a high risk of HIV transmission [8]. In many countries, especially in sub-Saharan Africa, biological screening for STIs is not financially accessible for many patients, and the management of these infections is based on symptoms [8]. Chlamydia trachomatis infection is asymptomatic for many years, an average of 10 years, and can be complicated by pelvic inflammatory disease due to adhesions, infertility, salpingitis, and ectopic pregnancies [9]. Intravaginal practices are widespread throughout the world. A study among Zimbabwean women found that 84% reported cleaning the inside of their vaginal cavity, and 40% reported drying their vagina by inserting pieces of cloth or paper [10]. Another study among Central African women reported that 51% engaged in cleaning their vaginal cavity and 28% inserted herbs into it [11]. These intravaginal practices are sometimes associated with sexually transmitted infections as they weaken the Doderlein flora. Data on intravaginal practices among Cameroonian women are scarce. The aim of our study was, on one hand, to determine the seroprevalence and risk factors for Chlamydia trachomatis infection and, on the other hand, to assess the link between intravaginal practices and women's education level.

Materials and Methods

Study Type, Duration, and Location

We conducted a cross-sectional study from March 17 to April 15, 2023, at the HIV/AIDS Care Unit of the SOA District Hospital, Yaoundé, Cameroon.

StudyPopulation

We recruited 80 patients from an HIV/AIDS care unit. The inclusion criteria were as follows: all participants were to be HIV-positive women, on antiretroviral treatment for at least six months, and presenting with pelvic pain and/or primary or secondary infertility. We excluded women who did not provide consent to participate and/or who had undergone antibiotic treatment within the previous week. The sample size was calculated using the Lorentz formula, based on a *Chlamydia trachomatis* prevalence rate of 9.4%, as reported in a prior study by Buve et al. in Cameroon [12].

Data Collection via Questionnaire

Each patient completed a questionnaire covering the following areas:

- **Socio-demographic data:** age, marital status, and education level.
- **Intravaginal practices:** such as vaginal douching with water or antiseptics, scraping the vaginal walls with fingers, or inserting materials like paper, cloth, or traditional herbs into the vagina.
- **Reasons for intravaginal practices:** including upbringing, prevention of STIs and/or pregnancy, elimination of odors and/or vaginal secretions, or vaginal tightening.
- **Antiretroviral treatment regimen.**

Chlamydia trachomatis **Screening :** Blood samples were collected from patients using both dry and EDTA tubes. After collection, the tubes were centrifuged at 2500 rpm for 15 minutes. The resulting serum and plasma were then aliquoted into pre-labeled cryotubes and stored in a refrigerator at 0–8°C. These cryotubes were placed in a cryobox and transported to the Chantal Biya International Reference Centre (CIRCB)—a National Reference Laboratory for HIV prevention and management research—in compliance with universal standards for the transfer of biological material [13].

The assay for anti-*Chlamydia trachomatis* IgG and IgM antibodies was performed on each serum sample using an ELISA kit from General Biologicals Corp. (Taiwan, R.O.C.), following the manufacturer's recommendations. According to the kit's protocol, a test is considered positive with an index greater than 1.0. However, to minimize the influence of serological scars from previous infections, our study used a more conservative positivity threshold of an index greater than 2.0. A result was considered negative if the index was less than 0.9. Any sample with an index between 0.9 and 1.99 was retested after two weeks.

Viral Load Testing and Confirmation of Positive HIV Serology

A new detection of the human immunodeficiency virus in the patients' serum was performed using rapid diagnostic tests (DetermineTM HIV-1/2, Alere Medical Co., Japan), and a second test was performed with Hexagon (Kora healthcare, Ireland, United Kingdom.

All patients included in the study underwent viral quantification (viral load) using an Abbott HIV Real Time TM Quantitative Assay amplifier. The viral load was considered undetectable for a value less than 40 copies/ml, detectable for any value between 40-1000 copies/ml, and failing if the value was between 1000-10,000,000 copies/ml.

Statistical Analysis

Data were recorded in Excel and then exported to SPSS version 20 for analysis. The statistical test used was the chi-square to compare proportions and associations between qualitative variables. The level of statistical significance was set at $p < 0.05$.).

Ethical Considerations

We obtained authorization from the Director of the SOA District Hospital to conduct this study in his institution. Each patient who agreed to participate in the study signed

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an informed consent form. We obtained authorization from the National Ethics Committee for Human Health Research under the number 2022/08/412/CE/CNERSH/SP.

Results

Our study population consisted mostly of women aged 30-40 years (45%), with a secondary education level (40%), primary level (37.5%), and University level (21.25%), and were predominantly single (50%). Were infected with Chlamydia trachomatis (50%). The most exposed age group was 30-40 years old (18.75%), but the difference with other age groups was not significant (p=0.223). University-educated women were less exposed to Chlamydia trachomatis infection (8.75%), unlike women with a primary education level who suffered from it the most (21.25%). Married women were more infected (28.75%), however, the difference with single, widowed, and divorced women was not significant (p=0.13). Women who engaged in intravaginal practices were more exposed to *Chlamydia trachomatis* infection (32.5%). Viral load had no significant influence on *Chlamydia trachomatis* infection (Table 1).

Table 1: Distribution of *Chlamydia trachomatis* infection according to sociodemographic characteristics, intravaginal practices, and viral load.

	Chlamydia trachomatis negatif (IgG and *IgM antichlamydia négatif) (%)*	*Chlamydia trachomatis* positif (IgG and/or IgM anti chlamydia positif) *(%)*	P value
Age (Yeras)			
[20-30[	6(7,5)	12(15)	P=0,223
[30-40[	21(26,25)	15(18,75)	
[40-50[	13(16,25)	13(16,25)	
Total	40(50)	40 (50)	
Level of education			
Primary	14(17,5)	17(21,25)	P=0,664
Secondary	16(20)	16(20)	
University	10(12,5)	7(8,75)	
Total	40(50)	40(50)	
Marital status			
Maried	14(17,5)	23(28,75)	P=0,13
Single	23(28,75)	15(18,75)	
Widaw/Divorce	3(3,75)	2(2,5)	
Total	40(50)	40(50)	
Intravaginales pratics			
Yes	28(35)	26(32,5)	P=0,461
Sometime	7(8,75)	5(6,25)	
No	5(6,25)	9(11,25)	
Total	40 (50)	40(50)	
Viral load			
Undetectable	34(42,5)	32(40)	P=0,556
Detectable	6(7,5)	8(10)	
Total	40(50)	40(50)	

67.5% of women engaged in intravaginal practices, with 41.63% reporting that these practices were passed down to them by their elders—mother or grandmother—while 26.57% did so to avoid sexually transmitted infections and/or pregnancy, 17.22% to prevent odors and/or eliminate secretions, and finally 5.35% to tighten and firm the vagina in order to enhance their partner's sexual pleasure. Women with secondary (31.25%) and primary (27.5%) education levels, totaling 58.75%, engaged significantly more in intravaginal practices compared to women with a University education (8.75%); p=0.001 (Table 2).

Table 2: Link between intravaginal practices and education level.

		Educaton level			P value
Intravaginals pratices	Total	Primary	Secondary	University	
		n(%)	n(%)	n(%)	P=0,001
Yes	54(67,5)	22(27,5)	25(31,25)	7(8,75)	
Sometime	12(15)	2(2,5)	4(5)	6(7,5)	
No	14(17,5)	7(8,75)	3(3,75)	4(5)	
Total	80(100)	31(38,75)	32(40)	17(21,25)	

Discussion

Chlamydia trachomatis infections predominantly affect sexually active young individuals, with key risk factors including multiple sexual partners and inconsistent condom use. In our study, the prevalence of *Chlamydia trachomatis* was 50% among the participants. This rate is substantially higher than those reported by Duval et al. (6.6% in a population of 620 women) and Buve et al. (9.4% among women in Yaoundé) [12-14]. This elevated prevalence can be attributed to our study population consisting exclusively of women living with HIV/AIDS, who demonstrate greater susceptibility to other sexually transmitted infections (STIs). Supporting this, Bathar et al. found that the prevalence of *Chlamydia trachomatis* is higher in HIV-positive women compared to their HIV-negative counterparts [3].

In the present study, women aged 30 to 40 years had the highest rate of HIV/AIDS infection (45%) and were also the most affected by *Chlamydia trachomatis* (18.75%). This may be explained by the peak of sexual activity during this age

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range, increasing exposure to STIs. In contrast, some authors have associated *Chlamydia trachomatis* infection with a younger age (under 29 years) [15]. Others have reported that young adults aged 18 to 35 account for 65.2% of sexually transmitted infections [16].

Educational attainment appeared to be a significant factor. Women with a university education had lower rates of both *Chlamydia trachomatis* (8.75%) and HIV/AIDS (21.25%) compared to women with only a primary education, among whom 21.25% were infected with *Chlamydia trachomatis* and 38.75% were HIV-positive. Jembia et al. similarly reported a low HIV/AIDS prevalence (3.8%) among students [17]. Fouedjio et al. identified a primary level of education as a primary risk factor for HIV infection [18]. A study on *Chlamydia* among students in Yaoundé, Cameroon, also reported a low prevalence (3.96%) [19]. These high prevalence rates among less-educated women are likely due to a lack of knowledge regarding the transmission of HIV/AIDS and *Chlamydia trachomatis*.

Married and single women had nearly similar HIV/AIDS infection rates (46.25% and 47.5%, respectively). However, married women had a higher prevalence of *Chlamydia trachomatis* infection (28.75%). This contrasts with findings from Novak et al., who reported that single women were more exposed to *Chlamydia trachomatis*, a finding justified by the likelihood of having multiple partners, as confirmed by Rahm et al. [20-21].

Women who engaged in intravaginal practices were more infected with both HIV/AIDS (67.5%) and *Chlamydia trachomatis* (32.5%) than women who did not (17.5% and 11.25%, respectively). Studies have revealed an association between vaginal douching and STIs, including *Chlamydia trachomatis*, among people living with HIV/AIDS [22, 23]. It is hypothesized that vaginal douching disrupts the vaginal flora, weakens the mucosal barrier, and thereby increases susceptibility to infections.

In the present study, HIV viral load had no significant influence on *Chlamydia trachomatis* infection (p=0.556). The majority of patients (82.5%, 66/80) had an undetectable viral load. This result is consistent with that of Voundi et al., who reported that 80% of their study patients had an undetectable viral load [24]. This high rate reflects significant progress, likely resulting from governmental efforts over the past five years to achieve the 90-90-90 targets [24].

Women with primary and secondary education levels engaged in intravaginal practices significantly more often (27.5% and 31.25%, respectively) than women with a university education (8.75%); p=0.001. Numerous studies have revealed that women with lower levels of education are more likely to engage in such practices [25 - 26].In our study, 26.57% of women who practiced intravaginal cleansing did so to avoid pregnancy and STIs. Similarly, Lazarus et al., in a study conducted in Soweto, reported that more than half of the women engaged in them for the same reasons [28]. This sufficiently demonstrates that intravaginal practices are widespread among African women.

Conclusion

Half of the women in the study were infected with *Chlamydia trachomatis*, and women with a primary level of education suffered from it the most. Those who engaged in intravaginal practices were more exposed to *Chlamydia trachomatis* infection.

Conflicts of Interest

The authors declare no conflict of interest.

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