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Prevalence and Antimicrobial Sensibility Profile *Ureaplasma urealyticum* and *Mycoplasma hominis* Isolated from Women in Brazzaville

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Abstract

Background: *Mycoplasma hominis* and *Ureaplasma urealyticum* are opportunistic pathogens frequently encountered in the female genital tract. They are involved in various infections that can lead to serious complications such as pregnancy complications, spontaneous abortions, bacterial vaginosis, salpingitis, and infertility. Syndromic management is common, but monitoring antibiotic sensitivity is crucial to limit the emergence and spread of resistant strains. **Methodology**: A descriptive and cross-sectional study was conducted at the Clinique Médico-Chirurgicale COGEMO in Brazzaville between January 2019 and December 2021, involving 162 sexually active women followed up in the gynecology-obstetrics department. Duplicate endocervical samples were collected and analyzed using the Mycoplasma AF Genital System kit (Liofilchem) to identify *Mycoplasma hominis* and *Ureaplasma urealyticum*, as well as their sensitivity profiles to fluoroquinolones, macrolides, and tetracyclines. **Results**: The prevalence of genital mycoplasmas was 21.6%. *Ureaplasma urealyticum* was detected in 10.49% of the samples, *Mycoplasma hominis* in 3.08%, and co-infections in 8.02%. Women infected with *Ureaplasma urealyticum* were generally in a couple, aged 28 to 37 years, unemployed, and asymptomatic. For *Mycoplasma hominis*, the profile was similar but with a wider age

range of 18 to 47 years. *Mycoplasma hominis* showed high resistance to pefloxacin (80%), erythromycin (60%), tetracycline (60%), and doxycycline (60%). In co-infections, resistances were 61.4% for erythromycin and 53.85% for tetracycline. *Ureaplasma urealyticum* showed a sensitivity significantly higher than 20% for all tested antibiotic molecules. **Conclusion**: This study highlights the high prevalence of *Mycoplasma hominis* and *Ureaplasma urealyticum* in the female genital tract and their concerning resistance to antibiotics. *Mycoplasma hominis* shows high resistance while *Ureaplasma urealyticum* presents better sensitivity, though still notable. The variability of observed sensitivity profiles underscores the need for personalized therapeutic approaches based on updated data to protect women's reproductive health.

Keywords

Ureaplasma urealyticum, *Mycoplasma hominis*, Antimicrobial Sensitivity, Prevalence

1. Introduction

Genital mycoplasmas, specifically *Mycoplasma hominis* and *Ureaplasma urealyticum*, are small bacteria lacking a cell wall, capable of multiplying autonomously [1]-[3]. *Ureaplasma urealyticum* belongs to the genus Ureaplasma and is characterised by its ability to hydrolyse urea. It relies heavily on this metabolic pathway to produce energy. While *Mycoplasma hominis* belongs to the Mycoplasma genus and is capable of metabolising arginine to produce energy [4]. These microorganisms are frequently encountered in the genital tract of asymptomatic sexually active women of reproductive age. Genital colonization by these bacteria varies worldwide, with rates ranging from 20% to 30% for *Mycoplasma hominis* and from 60% to 80% for *Ureaplasma urealyticum* [5] [6]. These bacteria are implicated in numerous pathologies and are generally associated with pelvic inflammatory diseases, endometritis, salpingitis, chorioamnionitis, as well as severe complications such as spontaneous abortions, infertility, prematurity, and low birth weight [7]-[9]. *Mycoplasma hominis* and *Ureaplasma urealyticum* play a significant role among the agents responsible for sexually transmitted infections, posing major public health problems.

Epidemiological data on mycoplasma infections vary according to the study population, socio-economic conditions, and geographical area. For example, Bartolini *et al.*, in 2017, found a prevalence of 24.6% in Padua, Italy; Zhu *et al.*, in 2012, reported 62.16% in China among patients with genital infections; and Gandji *et al.*, in 2013, observed 38.6% prevalence among women in Cotonou [10]-[12]. In Burkina Faso, Djigma *et al.*, in 2008, found a prevalence of 26.7%, while in Gabon, Kouegnignan *et al.*, in 2015, reported an incidence of 68.5%, and Mokoko *et al.*, in 2021, observed a prevalence of 64% in Pointe-Noire, Congo Brazzaville among infertile couples attending Louandjili Hospital [13]-[15]. The prevalences of *Ureaplasma urealyticum* and *Mycoplasma hominis* also vary

considerably. For example, in a tertiary hospital in China, 56.53% and 11.02% of outpatients in gynecology were infected, respectively [16]. Imudia *et al.*, in a retrospective study on patients undergoing initial infertility evaluation, observed 20.1% and 1.3%, respectively [17]. In Italy, prevalences of 9.0% and 8.6% were reported among women of reproductive age [18]. In Mali, Guindo *et al.*, in 2022, found prevalences of 53% and 6.1%, respectively [19], while in Cameroon, Thomas Djifack *et al.*, in 2020, detected prevalences of 48.8% and 5.6%, respectively [1].

The pathologies caused by these bacteria often remain underdiagnosed due to the non-specific nature of their symptoms. In developing countries, these infections are poorly documented due to syndromic management, poor clinical presentations, and the lack of adequate laboratory infrastructure. Mycoplasmas, lacking a cell wall, escape the action of beta-lactam antibiotics. Antibiotics active and commonly used against these microorganisms mainly include tetracyclines, macrolides, and fluoroquinolones [20]. Antibiotic resistance in *Ureaplasma urealyticum* and *Mycoplasma hominis* is a concerning issue and poses a growing threat to reproductive health [21]. An increase in resistance of these mycoplasmas has been reported globally over the past twenty years, reaching 10% and 35%, respectively, for *Ureaplasma urealyticum* and *Mycoplasma hominis* to tetracyclines [22]-[24]. In France, a resistance rate of 5.0% to tetracycline for *Mycoplasma hominis* and 5.4% to levofloxacin for *Ureaplasma urealyticum* was reported in 2018 [25]. Additionally, a study in Douala revealed resistance of *Ureaplasma urealyticum* to clindamycin *and Mycoplasma hominis* to erythromycin and tetracycline [26].

In Congo, few studies on the prevalence and epidemiology of these infections have been conducted, so their consequences are likely underestimated in the population. César *et al.*, in 2020, showed that sexually transmitted infections with Chlamydia and mycoplasmas were the most implicated in infertility among patients attending Louandili Hospital in Pointe-Noire [15]. The objective of this study was to determine the prevalence of genital mycoplasmas (*Mycoplasma hominis* and *Ureaplasma urealyticum*) isolated from our samples and to evaluate the sensitivity profile of these strains to commonly used antibiotics.

2. Materials and Methods

2.1. Study Period, Framework, and Patient Recruitment

This study was conducted in the laboratory of the Clinique Médico-Chirurgicale COGEMO in Brazzaville. It is a descriptive cross-sectional study carried out from January 1, 2019, to December 31, 2021. It included 162 sexually active women, followed in gynecology-obstetrics in various public and private hospitals and medical centers in the city of Brazzaville. The sample consisted of patients who came to the laboratory of the aforementioned clinic for medical tests prescribed by their attending physician.

Duplicate endocervical samples were collected and analyzed using the

Mycoplasma AF Genital System kit (Liofilchem) for the culture and identification of *Mycoplasma hominis* and *Ureaplasma urealyticum*, as well as to establish their sensitivity profiles to fluoroquinolones, macrolides, and tetracyclines. The main reasons for testing included couple infertility, leukorrhea, pelvic pain, miscarriages, abortions, and screening for sexually transmitted infections (STIs).

A total of 162 sexually active patients aged 18 to 55 years were included in this study, after obtaining their informed voluntary consent. Women undergoing antibiotic therapy, menstruating during the study period, and those who did not give their consent were excluded. All patients in this study were from the city of Brazzaville from different neighborhoods.

The variables studied included symptoms and sociodemographic data, collected using a survey form. The recruitment of the study population was exhaustive. The observed prevalences were compared to those of other studies using a homogeneity test.

2.2. Methodology

Identification of mycoplasmas was carried out using ready-to-use liquid media containing urea and arginine, allowing titration and identification of *Mycoplasma hominis* and *Ureaplasma urealyticum*. The commercial A.F. GENITAL SYSTEM kit from Diagnostic Liofilchem, comprising 24 wells, each containing a biochemical growth indicator substrate and antibiotics (selection markers), was used according to the manufacturer's instructions. Cultures with a titre of 10^5 colony-forming units (CFU) changed color.

Endocervical samples were collected using two sterile swabs provided in the sampling kits containing the transport and preservation medium (BD Universal Viral Transport for Viral, Chlamydia, Mycoplasma, and Ureaplasma specimens). These swabs were introduced into the fusiform cavity of the endocervix, rotated with a light and prolonged friction to capture the maximum cells, then discharged into the transport and preservation medium and transported to the laboratory at ambient temperature to be inoculated in the Mycoplasma A.F. GENITAL SYSTEM kit from Diagnostic Liofilchem according to the procedure indicated by the manufacturer.

The following antibiotics were tested for their respective sensitivity on *Mycoplasma hominis and Ureaplasma urealyticum*: doxycycline (DOX), minocycline (MIN), ofloxacin (OFL), pefloxacin (PEP), clarithromycin (CLA), tetracycline (TET), clindamycin (CD), josamycin (JOS), and erythromycin (E).

2.3. Statistical Analysis

Microsoft Office Excel 2016 software was used to create the database, and software for statistical SPSS (30.0) analyses. The results were expressed as counts and percentages for qualitative variables, or as means with their standard deviations for normally distributed quantitative variables, and medians with the first and third quartiles for skewed quantitative variables. The Chi-2 test or Fisher's exact test

was used to compare and evaluate the association between study variables and the occurrence of infection with *Mycoplasma hominis*, *Ureaplasma urealyticum*, and co-infections. The significance level was set at 0.05.

3. Results

The average age of the 162 included patients was 32 years, with a standard deviation of 6.97 (range: 18 to 55 years). Between January 2019 and December 2021, a total of 162 endocervical samples were analyzed. The results revealed 35 positive cases of genital mycoplasmas, indicating an overall prevalence of 21.6% (35/162). *Ureaplasma urealyticum* was identified alone in 10.5% of cases (17/162), *Mycoplasma hominis* in 3.1% (5/162), and a co-infection in 8.02% (13/162).

3.1. *Ureaplasma urealyticum*

Table 1 reveals that the most affected age group is 28 to 37 years. Formal employment is more common compared to other professional categories. Women in a relationship have a higher incidence than single women. Asymptomatic forms predominate over symptomatic forms. Women with a single partner have a higher incidence than those with multiple partners.

Table 1. Distribution of *Ureaplasma urealyticum* by age, profession, symptoms, marital status, contraceptive and number of partners.

Variables	Negative	Positive	OR [IC 95%]	p-value
	N = 132	*N = 30*		
Age (year), Avg ± sd	32.5 ± 6.86	30.8 ± 6.86	0.96 [0.91; 1.02]	0.216
age (year) range				1.000
18 - 27	35 (26.5%)	8 (26.7%)	0.96 [0.37; 2.53]	
28 - 37	59 (44.7%)	14 (46.7%)	Ref.	
38 - 47	34 (25.8%)	8 (26.7%)	0.99 [0.38; 2.60]	
48 - 55	4 (3.03%)	0 (0.00%)	0.00 [0.00; .]	
Profession				0.537
Non-formal employment	29 (22.0%)	4 (13.3%)	0.67 [0.20; 2.25]	Ref.
Formal employment	58 (43.9%)	12 (40.0%)	Ref.	0.403
pupil/student	9 (6.82%)	3 (10.0%)	1.61 [0.38; 6.85]	0.596
Unemployed	36 (27.3%)	11 (36.7%)	1.48 [0.59; 3.70]	0.188
Marital status				1.000
Single	5 (3.79%)	1 (3.33%)	Ref.	
Couple	127 (96.2%)	29 (96.7%)	1.14 [0.13; 10.1]	
Presence of symptoms				0.919
Asymptomatic	84 (63.6%)	20 (66.7%)	Ref.	Ref.
symptomatic	48 (36.4%)	10 (33.3%)	0.88 [0.38; 2.02]	0.769

Continued

Contraceptive				0.053
absence	128 (97.0%)	28 (93.3%)	Ref.	
Implant	0 (0.00%)	2 (6.67%)	. [.; .]	
IUD (Intrauterine device)	4 (3.03%)	0 (0.00%)	0.00 [0.00; .]	
Maternity desire	107 (81.1%)	28 (93.3%)	3.27 [0.73; 14.6]	0.175
Number of partners				0.427
>1	28 (21.2%)	9 (30.0%)	Ref.	
1	104 (78.8%)	21 (70.0%)	0.63 [0.26; 1.52]	

3.2. *Mycoplasma hominis*

The profile of the patients is that of women aged 18 to 47 years, unemployed, and living in a relationship. Asymptomatic forms predominate over symptomatic forms. Monogamy appears to be a protective factor (p-value = 0.007, OR = 0.24), reducing the risk by 0.24, as indicated in Table 2.

Table 2. Distribution of *Mycoplasma hominis* by age, profession, symptoms, marital status, contraceptive and number of partners.

Variables	negative	positive	OR [IC 95%]	p-value
	N = 144	***N = 18***		
Age (year), Avg. ± sd.	32.5 ± 6.77	30.0 ± 7.48	0.95 [0.88; 1.02]	0.198
age (year) range				0.657
18 - 27	37 (25.7%)	6 (33.3%)	1.81 [0.55; 6.02]	
28 - 37	67 (46.5%)	6 (33.3%)	Ref.	
38 - 47	36 (25.0%)	6 (33.3%)	1.86 [0.56; 6.19]	
48 - 55	4 (2.78%)	0 (0.00%)	0.00 [0.00; .]	
Profession				0.212
Non-formal employment	31 (21.5%)	2 (11.1%)	0.69 [0.13; 3.61]	
Formal employment	64 (44.4%)	6 (33.3%)	Ref.	
pupil/student	9 (6.25%)	3 (16.7%)	3.56 [0.75; 16.8]	
Unemployed	40 (27.8%)	7 (38.9%)	1.87 [0.59; 5.95]	
Marital status				0.513
Single	5 (3.47%)	1 (5.56%)	Ref.	
Couple	139 (96.5%)	17 (94.4%)	0.61 [0.07; 5.55]	
Presence of symptoms				1.000
Asymptomatic	92 (63.9%)	12 (66.7%)	Ref.	Ref.
symptomatic	52 (36.1%)	6 (33.3%)	0.88 [0.31; 2.50]	0.837
Contraceptive				1.000
absence	138 (95.8%)	18 (100%)	Ref.	
Implant	2 (1.39%)	0 (0.00%)	0.00 [0.00; .]	
IUD (Intrauterine device)	4 (2.78%)	0 (0.00%)	0.00 [0.00; .]	

Continued

Maternity desire	103 (81.1%)	16 (94.1%)	3.73 [0.47; 29.5]	0.307
Number of partners				0.007
>1	28 (19.4%)	9 (50.0%)	Ref.	
1	116 (80.6%)	9 (50.0%)	0.24 [0.09; 0.66]	

3.3. Coinfection *Mycoplasma hominis* et *Ureaplasma urealyticum*

In Table 3, the prevalence of coinfected patients was 13/162, or 8.02%.

Table 3. Distribution of coinfections *à Mycoplasma hominis et Ureaplasma urealyticum* by age, profession, symptoms, marital status, contraceptive and number of partners.

Variables	Negative	Positive	OR [IC 95%]	p-value
	N = 127	*N = 13*		
Age (year), Moy ± sd	32.5 ± 6.93	28.8 ± 8.08	1.09 [1.19; 0.99]	0.133
age year range				0.360
18 - 27	35 (27.6%)	6 (46.2%)	Ref.	
28 - 37	56 (44.1%)	3 (23.1%)	3.20 [0.75; 13.6]	
38 - 47	32 (25.2%)	4 (30.8%)	1.37 [0.35; 5.31]	
48 - 55	4 (3.15%)	0 (0.00%)	. [.; .]	
Profession				0.222
Non-formal employment	29 (22.8%)	2 (15.4%)	Ref.	
Formal employment	56 (44.1%)	4 (30.8%)	0.97 [0.17; 5.59]	
pupil/student	9 (7.09%)	3 (23.1%)	0.21 [0.03; 1.44]	
Unemployed	33 (26.0%)	4 (30.8%)	0.57 [0.10; 3.34]	
Marital status				0.449
Single	5 (3.94%)	1 (7.69%)	Ref.	
Couple	122 (96.1%)	12 (92.3%)	2.03 [0.22; 18.9]	
Presence of symptoms				0.542
Asymptomatic	82 (64.6%)	10 (76.9%)	Ref.	
symptomatic	45 (35.4%)	3 (23.1%)	1.83 [0.48; 6.99]	
Contraceptive				1.000
absence	123 (96.9%)	13 (100%)	Ref.	
IUD (Intrauterine device)	4 (3.15%)	0 (0.00%)	. [.; .]	
Maternity desire	103 (81.1%)	12 (92.3%)	0.36 [0.04; 2.89]	0.464
Number of partners				0.013
>1	26 (20.5%)	7 (53.8%)	4.53 [1.40; 14.6]	
1	101 (79.5%)	6 (46.2%)	Ref.	

3.4. Antibiotic Susceptibility Profile in Relation to Mycoplasmas

The most commonly used families of antibiotics, such as fluoroquinolones and cyclins, have shown higher levels of resistance than those observed with the macrolide family (Table 4). The overall antibiotic susceptibility of mycoplasma showed high resistance to pefloxacin, erythromycin and tetracycline, as shown in Figure 1.

Table 4. Susceptibility of *Ureaplasma urealyticum* and *Mycoplasma hominis* infections to antibiotics.

Antibiotics	*UU*			*MH*			*MH + UU*		
	S	I	R	S	I	R	S	I	R
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Fluoroquinolone									
Pefloxacin	4 (23.53)	7 (41.18)	6 (35.29)	0(0)	1(20)	4(80)	4 (30.77)	2(15.38)	7 (53.85)
Ofloxacin	10 (58.82)	5 (29.41)	2 (11.77)	2(40)	1(20)	2(40)	6 (46.15)	2 (15.38)	5 (38.46)
Macrolides									
Clarithromycin	10 (58.82)	5 (29.41)	2 (11.77)	3(60)	0(0)	2(40)	6 (58.46)	4 (30.77)	3 (20.77)
Clindamycin	9 (52.94)	5 (29.41)	3 (17.65)	1(20)	4(80)	0(0)	4 (30.77)	7 (53.85)	2 (15.38)
Erythromycin	7 (41.18)	5 (29.41)	5 (29.41)	0(0)	2(40)	3(60)	1 (7.70)	4 (30.77)	8 (61.54)
Josamicine	13 (76.47)	2 (11.77)	2 (11.77)	1(20)	4(80)	0(0)	6 (46.15)	7 (53.85)	0 (0)
Cycline									
Tétracyclin	4 (23.53)	5 (29.41)	8 (47.06)	0(0)	2 (40)	3(60)	4 (30.77)	2(15.3)	7 (53.85)
Minocyclin	6 (36.29)	4 (23.53)	7 (41.18)	2(40)	3(60)	0(0)	10(76.92)	3 (23.08)	0(0)
Doxycyclin	9 (52.94)	6 (36.29)	2 (11.77)	0(0)	2(40)	3(60)	3 (23.08)	8 (61.54)	2 (15.38)

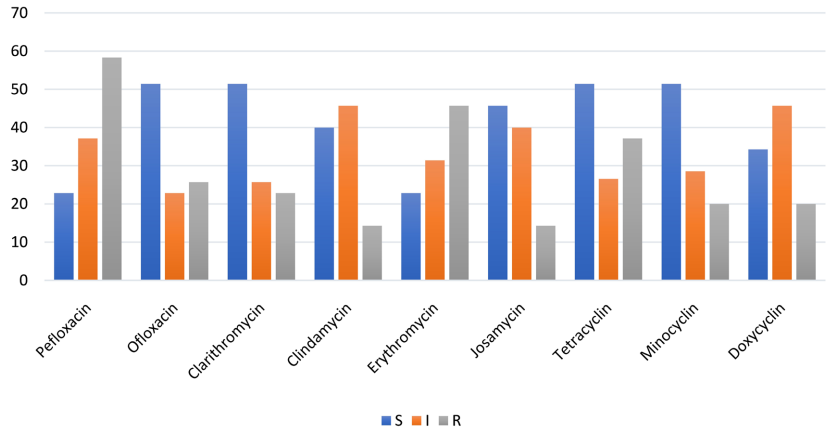

Figure 1. Overall sensitivity of genital mycoplasma to antibiotics (S = Sensitive, I = Intermediate, R = Resistant).

High levels of antibiotic resistance have been observed for *Mycoplasma hominis* and *Mycoplasma hominis* + *Ureaplasma urealyticum* co-infections. The following antibiotics show resistance rates for *Mycoplasma hominis*: pefloxacin (80%), erythromycin (60%), tetracycline (60%), and doxycycline (60%). Regarding *Mycoplasma*

hominis + *Ureaplasma urealyticum* co-infections, the resistance rates are as follows: erythromycin (61.4%), pefloxacin (53.85%), and tetracycline (53.85%).

4. Discussion

This study aimed to determine the prevalence and antibiotic sensitivity profile of genital mycoplasma strains (*Ureaplasma urealyticum* and *Mycoplasma hominis*) isolated from samples collected from women consulting in gynecology-obstetrics. The study population comprised women living in urban areas of Brazzaville, of reproductive age, and sexually active. Detection, identification, and antibiotic sensitivity tests were carried out using the Mycoplasma AF Genital System kit from Liofilchem. This phenotypic diagnostic method is rapid and simple compared to conventional culture methods, which are often laborious and slow, and PCR, which is often inaccessible in developing countries.

Among the 162 women studied, 35 positive cases of mycoplasmas were documented: 10.49% (17/162) for *Ureaplasma urealyticum,* 3.08% (5/162) for *Mycoplasma hominis*, and 8.02% (13/162) for mixed infections *(Ureaplasma urealyticum* and *Mycoplasma hominis*). The results indicate a disproportionate incidence with a predominance of *Ureaplasma urealyticum*, followed by co-infections, and lastly, *Mycoplasma hominis*. These findings align with those of numerous authors who report a higher proportion of *Ureaplasma urealyticum* infections [27]-[29]. Several factors may explain this predominance of *Ureaplasma urealyticum*. Firstly, it is possible that this pathogen is more resilient or more adept at colonizing the female genital tract compared to *Mycoplasma hominis*. Additionally, sexual behaviors and healthcare practices may play a role in this high incidence. Co-infections, representing 8.02% of cases, demonstrate that patients can be simultaneously colonized by multiple mycoplasmas, complicating diagnosis and treatment. The coexistence of these pathogens could be due to environmental factors or common lifestyle habits favoring multiple colonizations.

The prevalences of genital mycoplasmas vary from country to country but share certain similarities: *Ureaplasma urealyticum* is more frequently isolated than Mycoplasma hominis, and both microorganisms are commonly isolated in sexually active individuals [8]. The colonization rate of *Ureaplasma urealyticum* in this population was 10.49%. This result differs from those observed by Baraika *et al.* (2020) in Gabon (64.7%), Mefo *et al.* (2023) in Cameroon (34.1%), and Bolti *et al.* (2022) in Chad (63.8%) [30]-[32]. The prevalence of Mycoplasma hominis in this study was 3.08%, a rate that differs from the results obtained by Baraika *et al.* (2020) in Gabon (22.7%), Mefo *et al.* (2023) in Cameroon (11.4%), and Bolti *et al.* (2022) in Chad (13.8%) [30]-[32]. Variations between results obtained in Congo, Gabon, and Cameroon may be attributed to differences in research methodologies, characteristics of the studied populations, or other contextual factors. Risky sexual behaviors and specific cultural practices may also play a role in the spread of these infections.

The results of this study revealed no significant association between symptoms,

profession, and infections with *Ureaplasma urealyticum* and *Mycoplasma hominis*. These observations are consistent with the results obtained by Diadhiou *et al.* (2019) in Dakar [33]. Several factors could explain this lack of significant association. Firstly, it is possible that infections with *Ureaplasma urealyticum* and *Mycoplasma hominis* are largely asymptomatic, complicating the identification of direct correlations with specific symptoms. Furthermore, the profession of the participants may not directly influence the incidence of these infections, which are primarily transmitted sexually. Additionally, these results suggest that risk factors commonly associated with other sexually transmitted infections, such as profession or the presence of specific symptoms, do not necessarily apply to infections with *Ureaplasma urealyticum* and *Mycoplasma hominis*. This observation underscores the importance of developing specific screening and treatment strategies for these pathogens, independently of traditional risk factors.

The results of this study show that the age group most affected by Ureaplasma urealyticum is between 28 and 37 years, with a prevalence of 8.66%, while women aged over 48 years are the least affected. Previous studies conducted by R. Ahounga *et al.* (2020), Wang *et al.* (2016), and Imudia *et al.* (2008) have also revealed a higher prevalence in the 26 to 39 age group. A common point among these studies is the higher colonization in women aged 25 to 35 years, probably due to high sexual activity and non-use of condoms. These behaviors can increase the risk of infection with *Ureaplasma urealyticum*. These results highlight the importance of targeting public health interventions and awareness campaigns towards sexually active young adults. Promoting condom use and safe sexual practices could reduce the prevalence of Ureaplasma urealyticum infections in this age group. Moreover, it would be beneficial to strengthen access to healthcare and screening services for this population to detect and treat infections at an early stage.

The incidence of Ureaplasma urealyticum is higher in pregnant and sexually active women, as demonstrated by Iwasaka and McCormack [34]-[35]. The majority of women in couples use few contraceptives, and having only one partner is a protective factor against these infections. Conversely, multiple sexual partners, age, and socio-economic status are major risk factors, increasing the chances of sexually transmitted infections with each new partner [5].

Our study revealed significant variability in the antimicrobial sensitivity profiles of *Ureaplasma urealyticum* and *Mycoplasma hominis* strains isolated. The macrolide group showed higher sensitivity compared to cyclines and fluoroquinolones. The highest sensitivity for *Ureaplasma urealyticum* was observed with clarithromycin, josamycin, and ofloxacin, with a rate of 58.82%. This result aligns with those obtained by Bayraktar *et al.* (2010) [5], who also reported satisfactory results with clarithromycin and josamycin. For *Mycoplasma hominis*, clarithromycin exhibited high sensitivity at 60%, followed by ofloxacin and minocycline at 40%. Conversely, resistance of 60% and 80% was noted for doxycycline and pefloxacin, respectively. Notably, no resistance of *Mycoplasma hominis* strains to

josamycin and clindamycin was observed. This finding is consistent with the results obtained by Min Young Lee *et al.* (2016), who showed that all *Mycoplasma hominis* strains were sensitive to josamycin [36]. This sensitivity of *Mycoplasma hominis* to josamycin and clindamycin could be explained by their recent and infrequent use, their specific mechanisms of action, the lack of bacterial population exposure to these antibiotics, and inherent genetic differences between bacterial strains.

Co-infections showed a high sensitivity of 76% to minocycline, but a high resistance to erythromycin of 61.28%, likely due to the presence of *Mycoplasma hominis*. Tetracycline and erythromycin also exhibited high resistance rates, ranging from 40% to 60% for mycoplasmas. These results diverge from those reported by Skiljevic *et al.* (2016) [24]. Several factors may explain these discrepancies. Firstly, there could be methodological differences between the studies, such as sampling techniques, analysis methods, or study populations. Geographical and socio-demographic variations can also influence sensitivity and resistance rates, as access to healthcare, antibiotic prescription practices, and sexual behaviors can vary significantly from one region to another. Additionally, the excessive and inappropriate use of antibiotics, particularly among children and pregnant women in certain African populations, can lead to acquired resistance and therapeutic failures, as demonstrated in a study of women in Bamako, Mali [19], and another study of pregnant women in Egypt [37]. This observation is supported by previous studies that have demonstrated that over-prescription of antibiotics is a key factor in the emergence of resistance. It is also important to consider the genetic mechanisms underlying the observed resistance. For example, some mycoplasmas acquire resistance to tetracycline via the Tet (M) mutation [38], which can explain the high resistance rates in this study.

Among all the tested isolates, overall resistance to fluoroquinolones ranged from 25.71% for ofloxacin to 40% for pefloxacin, which remains high. Conversely, the absence of resistance of *Mycoplasma hominis* isolates to josamycin and clindamycin, as well as the sensitivity of *Mycoplasma hominis* and *Ureaplasma urealyticum* isolates to clarithromycin, demonstrate the good activity of these molecules against mycoplasmas. These results confirm that josamycin, clindamycin, and clarithromycin are important therapeutic agents for treating infections primarily caused by *Mycoplasma hominis* and *Ureaplasma urealyticum*.

5. Conclusions

This study reveals that *Mycoplasma hominis* and *Ureaplasma urealyticum* are common opportunistic pathogens in the female genital tract, presenting concerning antibiotic resistance rates. *Mycoplasma hominis* shows high resistance, necessitating continuous surveillance to adapt treatments and limit the spread of resistant strains. *Ureaplasma urealyticum* shows better sensitivity, although its prevalence remains notable. The variability in observed sensitivity profiles highlights the need for personalized therapeutic approaches, considering the specificities of

local strains and prescription practices. Clindamycin, josamycin, and clarithromycin emerge as promising therapeutic options, although continuous monitoring is required to prevent the emergence of new resistances. The results underscore the importance of a proactive and informed approach, based on personalized therapeutic strategies guided by updated sensitivity data, to protect women's reproductive health. Increased vigilance and continuous treatment adaptation are crucial to prevent severe complications and ensure effective management of genital infections.

In order to disseminate knowledge and awareness of women's reproductive health, sexual and reproductive education needs to be strengthened, community awareness campaigns need to be conducted, the health system needs to be strengthened in the introduction of accessible diagnostic tools, community and religious leaders need to be involved, research and advocacy need to be supported with the aim of including reproductive health in national public health priorities, and a sufficient budget needs to be allocated for mass campaigns. Men also need to be involved to make them aware of their role in women's reproductive health, particularly in terms of contraception and support during pregnancy and motherhood.

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This study was not financed.

Data Availability

All data used in this study are available from the corresponding author upon request.

Consent

Informed consent was obtained for each participant or from a parent or guardian for underage participants.

Authors' Contributions

MJSMB and JPSB carried out the analyses in collaboration with the technicians at the Clinique Medical Chirurgical COGEMO laboratory to obtain the results. ENNO, BNP, VVGN, FLM, MT and NN contributed to improving the manuscript. MJSB, ENNO and BMP participated in the revision of the research project.

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Conflicts of Interest

The authors do not declare any conflict of interest.

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Abbreviations

S	Sensitivity
I	Intermediate
R	Resistant
U.U	*Ureaplasma urealyticum*
M.H	*Mycoplasma hominis*