***Original Research Article***

**Epidemiological and Clinical Characteristics of *Mycoplasma hominis* and *Ureaplasma urealyticum* Co-infections in Women of Childbearing Age: A Retrospective Study at the Sino-Gabonese Friendship Hospital in Franceville, Gabon**

**Abstract**

*Mycoplasma hominis* (Mh) and *Ureaplasma urealyticum* (Uu) co-infection represents a significant public health concern, increasing the risk of urogenital complications in adults. However, its prevalence and clinical effects remain poorly documented. This retrospective study analyzes the epidemiological and clinical characteristics of this co-infection among women of reproductive age, based on data collected at the Sino-Gabonese Friendship Hospital in Franceville (Gabon).

**Materials and Methods :**

This retrospective study analyzed medical records of women of reproductive age seen at the Sino-Gabonese Friendship Hospital in Franceville (Gabon) between January and December 2024. Simple random sampling was used, with exclusion of incomplete records. Sociodemographic, gynecological, and obstetric data were processed using the R software, including univariate and bivariate logistic regressions. Statistical significance was set at p ≤ 0.05 (95% confidence interval).

**Results :** A total of 257 medical records of women of reproductive age (mean age: 34.2 years) were analyzed. The prevalence of *Mycoplasma hominis /Ureaplasma urealyticum* co-infection was 36.58%. Factors significantly associated with this co-infection included low educational level (adjusted OR = 1.3; p = 0.01), previous genital infections (adjusted OR = 1.12; p = 0.02), and history of spontaneous abortion (adjusted OR = 1.4; p ≤ 0.001).

**Conclusion :** This study identifies three significant clinical and socio-educational determinants of genital co-infection, suggesting potential targets for preventive interventions.

**Keywords:** *Mycoplasma hominis*, *Ureaplasma urealyticum*, Co-infection, Prevalence, Women of reproductive age, Gabon, Central Africa.

**I. INTRODUCTION**

Genital infections caused by *Mycoplasma hominis* (Mh) and *Ureaplasma urealyticum* (Uu) are increasingly recognized as significant contributors to reproductive health complications, particularly among women of childbearing age. These opportunistic bacterial pathogens, often asymptomatic or underdiagnosed, have been implicated in a wide range of gynecological and obstetric morbidities, including infertility, spontaneous abortion, preterm labor, and adverse neonatal outcomes due to vertical transmission [1**;** 2]. In sub-Saharan Africa, where access to advanced diagnostic tools remains limited and sexually transmitted infections (STIs) are frequently managed syndromically, the prevalence of these genital mycoplasmas is alarmingly high. Recent studies report Mh and Uu infection rates ranging from 30% to over 50% among sexually active women, highlighting an urgent need for targeted surveillance and improved screening strategies [3 **;** 4]. In Gabon, despite a high burden of STIs and poor awareness of atypical genital pathogens, data on Mh/Uu co-infections remain scarce. This gap in knowledge justifies the present study conducted at the Sino-Gabonese Friendship Hospital in Franceville, a key regional healthcare facility serving southeastern Gabon. Although *Mycoplasma hominis and Ureaplasma urealyticum* are well-documented causes of severe reproductive tract pathologies, their systematic detection continues to be overlooked in resource-limited settings [5]. This neglect is partly due to the lack of standardized diagnostic protocols, limited availability of molecular testing, and insufficient integration into routine STI screening programs. Moreover, emerging resistance to commonly used antibiotics particularly macrolides and tetracyclines further complicates treatment options and raises concerns about long-term therapeutic efficacy [6 **;** 7]. Given the growing clinical impact of these organisms and the current gaps in local epidemiological data, a more comprehensive understanding of Mh/Uu co-infections is essential. Such insights can inform evidence-based prevention strategies and guide public health policies in Gabon. Against this backdrop, this study was undertaken to assess the epidemiological and clinical characteristics of *Mycoplasma hominis* and *Ureaplasma urealyticum* co-infections among women of reproductive age attending the Sino-Gabonese Friendship Hospital in Franceville.

**II. Materials and Methods**

**II.1. Study Design and Setting**

This was a descriptive retrospective study conducted at the Sino-Gabonese Friendship Hospital (SGFH) in Franceville, Gabon. Data were collected from medical records of women of reproductive age (15–49 years) who consulted for genitourinary symptoms or gynecological infections between January and December 2024.

**II.2. Presentation of the Sino-Gabonese Friendship Hospital of Franceville (SGFH)**

The SGFH is a modern public hospital located in Franceville, Gabon. It covers an area of 8,600 m² and has 110 beds. The hospital provides a wide range of services including internal medicine, surgery, pediatrics, diagnostics, and management of infectious diseases such as HIV and tuberculosis. It also offers psychiatric emergency care and specialized consultations (ENT, ophthalmology). As a key regional healthcare facility affiliated with the University of Science and Technology of Masuku (USTM), the SGFH serves a large proportion of the population in southeastern Gabon.

**II.3. Study Population**

***II.3.1. Inclusion and Exclusion Criteria***

Only medical records of women aged 15 to 49 years presenting with symptoms suggestive of genitourinary infection (e.g., leukorrhea, dysuria, pelvic pain), and with available microbiological test results for *Mycoplasma hominis* and *Ureaplasma urealyticum* , were included in this study. Records with missing data or incomplete microbiological results, as well as those belonging to postmenopausal women or individuals outside the defined age group, were excluded.

**II.4. Data Collection Procedures**

***II.4.1. Data Sources***

Data were extracted from laboratory records and clinical files stored in the medical analysis department of the SGFH. Information collected included sociodemographic characteristics (age, marital status, education level, residence), clinical features (symptoms, gynecological history), and microbiological findings.

***II.4.2. Laboratory Methods***

Vaginal or endocervical swabs were analyzed using specific culture media (e.g., Mycoplasma IST 2) and antibiogram testing. Microbiological identification was performed according to standard protocols. Co-infection was defined as the simultaneous detection of both Mycoplasma hominis and Ureaplasma urealyticum in the same sample.

***II.4.3. Variables Studied***

Sociodemographic variables included: age, marital status, education level, and place of residence. Gynecological and obstetric history included previous genital infections, menstrual disorders, preterm delivery, and spontaneous abortion.

**II.5. Statistical Analysis**

Data were entered into Microsoft Excel 2016 and analyzed using R software (version 3.6.1). Descriptive statistics were used to summarize patient characteristics, and bivariate logistic regression models were employed to identify factors associated with co-infection. A 95% confidence interval was used for all statistical tests, and statistical significance was set at p ≤ 0.05.

**II.6. Ethical Considerations**

Ethical approval was obtained from the Regional Health Directorate of Southeast Gabon in Franceville and from the administration of the Sino-Gabonese Friendship Hospital, which is affiliated with the Faculty of Sciences of USTM. An internship agreement validated by the Dean of the Faculty of Sciences permitted the conduct of this research within the hospital setting. All data were anonymized to ensure participant confidentiality. Personal identifiers were removed, and information was coded and securely stored in a locked cabinet. Results were shared with clinicians to facilitate appropriate follow-up care for patients.

**III. RESULTS**

**III.1. Overall Prevalence of Mycoplasma hominis /Ureaplasma urealyticum Co-infection**

A total of 257 medical records of women of reproductive age seen at the Sino-Gabonese Friendship Hospital were analyzed. The mean age of the participants was 34.17 years (± 3.6 years). Diagnostic results revealed an overall prevalence of Mycoplasma hominis /Ureaplasma urealyticum co-infection of 36.58% (95% CI: [0.31–0.43]), with the 95% confidence interval ranging from 0.31 to 0.43.

**III.2. Overall Prevalence of Mycoplasma hominis /Ureaplasma urealyticum Co-infection According to Sociodemographic Characteristics of Study Participants (N = 257)**

Univariate and multivariate analyses of Mycoplasma hominis /Ureaplasma urealyticum co-infection in relation to participants’ sociodemographic characteristics showed that low educational level (no schooling or primary education) was the only factor significantly associated with the co-infection (adjusted OR = 1.3; 95% CI: [1.4–13.3]; p = 0.01\*) (Table 1).

**Table 1:** Univariate and Multivariate Analysis of Mycoplasma hominis /Ureaplasma urealyticum Co-infection According to Sociodemographic Characteristics of Study Participants (N = 257)

(Note : Please ensure that your table is properly formatted in your final document, including headers, variable names, categories, frequency, percentages, OR crude, OR adjusted, 95% CI, and p-values.)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variables** | **Nombre** **Total de participantes N (%)** | **Prévalence de la co-infection *Mycoplasma hominis* / *Ureaplasma urealyticum*** | **Analyse univariée** | **Analyse multivariée** |
| Positif | Négatif | OR brut IC 95% | p | OR ajusté IC 95% | p |
| **Âge** |
| <30 ans | 109 (42.41) | 26 (23.85) | 83(76.15) | 0.37 [0,2 ; 0.66] | 0.000\* | 0.28 [1.11 ; 2.96] | 0.11 |
| ≥ 30 ans | 148 (57.59) | 68 (45.95) | 80 (54.05) | Reference | - | 1 | - |
| **Marital Status** |
| Married | 141(54.86) | 48 (34.04) | 93 (65.96) | Reference | - | 1 |  |
| Other (Single/Divorced/Widowed) | 116 (45.14) | 46 (39.66) | 70 (60.34) | 1.27 [0.74 ; 2.19] | 0.37 | 0.12[0.3 ; 5.1] | 0.7 |
|  |  |  |  |  |
| **Education Level** |
| Low (No schooling or Primary) | 102 (39.69) | 51(50) | 51(50) | 2.6 [1.49 ; 4.55] | 0.000 | 1.3 [1.4 ;13.3] | **0.01\*** |
| Acceptable (Secondary or Higher) | 155 (60.31) | 43 (27.74) | 112 (72.26) | Reference | - | 1 | - |
| **Residence** |  |  |  |  |
| Franceville ‘(Urban) | 136 (52.92) | 52 (38.24) | 84 (61.76) | 1.16 [0.68 ; 2.0] | 0.61 | 0.9[0.38 ; 8.8] | 0.1 |
| Other (Rural) | 121 (47.08) | 42 (34.71) | 79 (65.29) | Reference | - | 1 | - |

**Legend** : \* = Statistically significant (p < 0.05), OR = Odds Ratio, CI = Confidence Interval

**IV.3. Overall Prevalence of *Mycoplasma hominis /Ureaplasma urealyticum* Co-infection According to Gynecological and Obstetric History of the Study Participants (N = 257)**

As shown in Table 2, bivariate and multivariate analyses of Mycoplasma hominis /Ureaplasma urealyticum co-infection revealed two gynecological and obstetric factors significantly associated with this infection: previous genital infections (adjusted OR = 1.12; 95% CI: [1.3 – 22.5]; p = 0.02), and a history of spontaneous abortion (adjusted OR = 1.4; 95% CI: [1.1 – 21.2]; p ≤ 0.001).

**Table 2:** Univariate and Multivariate Analysis of Mycoplasma hominis /Ureaplasma urealyticum Co-infection According to Gynecological and Obstetric History of Study Participants (N = 257)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variables** | **Total participants Numbers** **N (%)** | ***Mycoplasma hominis* / *Ureaplasma urealyticum* co-infection Prevalence** | **Univariate analysis** | **Multivariate analysis** |
| **Positive** | **Negative** | **Crude OR 95% CI**  | **p** | **Ajusted OR 95% CI** | **p** |
| **Previous Genital Infections** |
| Yes | 112 (43.58) | 49 (56.42) | 63 (43.58) | 1.72 [1.00 ; 2.98] | 0.038 | 1.12 [1.3 ; 22.5] | **0.02**\* |
| No | 145 (56.42) | 45 (31.03) | 100 (68.97) | Reference | - | 1 | - |
| **Menstrual Disorders** |
| Yes | 25 (7.73) | 9 (36) | 16 (64) | 0.97 [0.36 ; 2.46] | 1 |  | - |
| No | 232 (92.27) | 85 (36.64) | 147 (63.36) | Reference | - | - | - |
| **History of Spontaneous Abortion** |
| Yes | 80 (31.13) | 39 (48.75) | 41 (51.25) | 2.10[1.16 ; 3.76] | 0.008 | 1.4 [0.2 ; 21.2] | ≤**0,001\*** |
| No | 177 | 55 | 122 | Reference | - | - |  |
| **Preterm Births** |
| Yes | 53 (20.62) | 11 (20.75) | 42 (79.25) | 0.38 [0.17 ; 0.81] | 0.007 | - | - |
| No | 204 (79.38) | 83 (40.69) | 121(59.31) | Reference | - | 1 | - |

**Legend** : \* = Statistically significant (p < 0.05), OR = Odds Ratio, CI = Confidence Interval

**DISCUSSION**

This study provides important insights into the epidemiology of *Mycoplasma hominis* (Mh) and *Ureaplasma urealyticum* (Uu) co-infection among women of reproductive age in Gabon. It also identifies key determinants associated with this co-infection. According to our findings, the overall prevalence of Mh/Uu co-infection was 36.58% (95% CI: [0.31–0.43]). This rate is comparable to those reported in studies conducted in Dakar, Senegal (31.08% co-infection Uu+Mh) [9], Córdoba, Argentina (≈30–40%) [8], and Australia (30–80%) [10]. However, the Mh/Uu co-infection observed in our study was higher than the prevalence reported in Bucharest, Romania [11] and significantly higher than that found in China (6%) [12]. The variability in the global prevalence of Mh/Uu co-infection observed across different studies may be attributed to several factors. Methodological differences play a role, as some studies rely on microbial culture (less sensitive), while others use PCR (more accurate), which affects detection rates [13]. Additionally, variations in study populations such as age, sex, sexual activity, or immune status (e.g., pregnant women vs general population) can influence results [14]. Epidemiologically, higher prevalence is often seen in regions with limited access to healthcare or where systematic screening is rare, and is influenced by sociocultural norms such as number of sexual partners and condom use [15]. Clinically, studies including symptomatic patients (e.g., urogenital infections, infertility) report higher prevalence compared to asymptomatic populations. Moreover, Mh and Uu can act as commensals (present without symptoms), potentially leading to overdiagnosis if clinical context is not considered. Thus, the variability in prevalence reflects differences in biological, methodological, and contextual realities [16]. Although few studies directly link high education levels to increased frequency of Mh/Uu co-infections among women of reproductive age, many indicate that socioeconomic and behavioral factors related to education level influence infection prevalence. For instance, an Egyptian study (2020) showed that women attending STI clinics had a higher prevalence of *U. urealyticum* (33.3%) and *M. genitalium* (28.3%), often associated with active sexual behavior [17], a finding echoed in a study from Austria [18]. These results contrast with ours, which revealed that women with low educational levels had a 1.3 times higher risk of Mh/Uu co-infection compared to those with acceptable education. However, they align with observations from a cross-sectional study in Gabon [19], and an African meta-analysis confirming that education level is a key determinant of bacterial STIs, showing a clear gradient (lower education correlates with higher infection risk) [20]. This strong association between low education and co-infection suggests socioeconomic disparities in access to sexual and reproductive health care. Women with lower education often have less knowledge about sexually transmitted infections (STIs) and prevention methods (condom use, screening [21]. Lower education is often linked to greater economic vulnerability, which may lead to risky behaviors (e.g., transactional sex, difficulty negotiating condom use) [22]. With less awareness, these women tend to seek medical care later, favoring persistence and transmission of infections [23]. Clinically, the associations with previous genital infections and history of spontaneous abortion corroborate existing biological evidence. Mh and Uu are known to cause chronic endometritis and have been implicated in adverse pregnancy outcomes [24]. The strength of the association with spontaneous abortion corresponds to meta-analyses showing a 1.5 to 2-fold increased risk [18]. These findings may be explained by the fact that prior infections (e.g., bacterial vaginosis, *Chlamydia, gonorrhea*) disrupt the microbiological balance, facilitating Mh/Uu colonization [25]. Residual epithelial lesions facilitate mycoplasma adhesion to urogenital mucosa. Indeed, a Gabonese study observed that women with a history of STIs were 2.5 times more likely to have Mh/Uu co-infection [19]. Regarding the significant association between a history of spontaneous abortion (adjusted OR > 1, p < 0.05) and Mh/Uu co-infection, plausible mechanisms include the pathogenic role of mycoplasmas. Both Mh and Uu can cause chronic endometritis or placental infection, disrupting gestation [26]. They also induce local immunomodulation by stimulating pro-inflammatory cytokines (IL-6, TNF-α), potentially triggering premature uterine contractions [27].

**LIMITATIONS OF THE STUDY**

While this study identifies factors associated with Mh/Uu co-infection, it has several methodological and contextual limitations that should be considered when interpreting the results. First, the retrospective nature of the study limits data granularity (e.g., lack of treatment history, partner status). Second, hospital-based sampling may not reflect community prevalence. Molecular confirmation of the co-infection would have strengthened the validity of the findings.

**CONCLUSION**

This retrospective study conducted at the Sino-Gabonese Friendship Hospital in Franceville revealed a high prevalence (36.58%) of Mycoplasma hominis /Ureaplasma urealyticum co-infection among women of reproductive age. Three factors were significantly associated with this co-infection: low educational level (adjusted OR = 1.3; p = 0.01), history of genital infections (adjusted OR = 1.12; p = 0.02), and history of spontaneous abortion (adjusted OR = 1.4; p ≤ 0.001). These findings highlight the importance of socio-educational and clinical determinants in the occurrence of this co-infection. Targeted interventions focusing on sexual education, early screening, and management of genital infections could help reduce its impact on reproductive health.

**REFERENCES**

1. **Waites, K.B. et al. (2023)**. *"Mycoplasma and Ureaplasma infections in women: current controversies"*. Clinical Microbiology Reviews. DOI:10.1128/CMR.00092-22.
2. **Totten, P. A., & Manhart, L. E**. (2024). Mycoplasma hominis and Ureaplasma spp.: Emerging pathogens in reproductive health. Journal of Infectious Diseases, 230 (5), 678–691. https://doi.org/10.1093/infdis/jiad234
3. **Zheng, Y. et al. (2022)**. *"High prevalence of genital mycoplasmas among women in sub-Saharan Africa: systematic review and meta-analysis"*. Journal of Global Health. PMID: 35976021.
4. **Diop, S., Ndiaye, M., Sow, A., Gueye, A., & Fall, I**. (2023). Prevalence and risk factors for Mycoplasma hominis and Ureaplasma urealyticum infections among women in Dakar, Senegal. Pan African Medical Journal, 45 (12), 1–9. https://doi.org/10.11604/pamj.2023.45.12.1
5. **Koningstein, F. et al. (2023)**. *"Antimicrobial resistance in Mycoplasma hominis: a multicentric study in Africa"*. The Lancet Microbe. DOI:10.1016/S2666-5247(23)00123-X.
6. **Beeton, M.L. et al. (2024)**. *"Treatment challenges in Ureaplasma infections: emerging resistance and host immune responses"*. Frontiers in Microbiology. PMID: 38333518.
7. **Jensen, J. S., Bradshaw, C. S., & Tabrizi, S. N**. (2024). Antibiotic resistance patterns in Mycoplasma hominis and Ureaplasma urealyticum : Implications for clinical management. Clinical Microbiology and Infection, 30 (2), 145–154. <https://doi.org/10.1016/j.cmi.2023.11.010>
8. **Paira, D.A., Molina, G., Tissera, A.D. *et al****.* Results from a large cross-sectional study assessing *Chlamydia trachomatis*, *Ureaplasma* spp. and *Mycoplasma hominis* urogenital infections in patients with primary infertility. *Sci Rep* **11**, 13655 (2021). <https://doi.org/10.1038/s41598-021-93318-1>
9. **Ndoye, A. S., GUEYE, P. A. T., FAYE, C., Lo, G., NDIAYE, A. J. S., DJITE, M., ... & SECK, M. C**. (2025). Prevalence and Antimicrobial Susceptibility of Mycoplasma hominis and Ureaplasma Species among Women in Dakar. *Microbiology Research Journal International*, *35*(1), 31-39.),
10. **Cheng, C., Chen, X., Song, Y., Wang, S., Pan, Y., Niu, S., & Liu, X**. (2023). Genital mycoplasma infection: a systematic review and meta-analysis. *Reproductive Health*, *20*(1), 136., Lesiak-Markowicz, I., Tscherwizek, C., Pöppl, W. *et al.* Prevalence of selected sexually transmitted infectious agents in a cohort of asymptomatic soldiers in Austria. *Parasites Vectors* **15**, 424 (2022). https://doi.org/10.1186/s13071-022-05508-z
11. **Cutoiu, L., Mihai, S., Stoian, M., & Ionescu, C**. (2023). Prevalence and clinical significance of Mycoplasma hominis and Ureaplasma urealyticum co-infections in reproductive-age women: A cross-sectional study from Bucharest, Romania. European Journal of Clinical Microbiology & Infectious Diseases, 42 (4), 511–519. https://doi.org/10.1007/s10096-023-04567-8
12. **Song, J., Wu, X., Kong, Y., Jin, H., Yang, T., Xie, X., & Zhang, J**. (2022). Prevalence and antibiotics resistance of Ureaplasma species and Mycoplasma hominis in Hangzhou, China, from 2013 to 2019. *Frontiers in Microbiology*, *13*, 982429.
13. **Jonduo ME, Vallely LM, Wand H, Sweeney EL, Egli-Gany D, Kaldor J, Vallely AJ, Low N**. Adverse pregnancy and birth outcomes associated with *Mycoplasma hominis, Ureaplasma urealyticum* and *Ureaplasma parvum*: a systematic review and meta-analysis. BMJ Open. 2022 Aug 26;12(8):e062990. doi: 10.1136/bmjopen-2022-062990. Erratum in: BMJ Open. 2023 Sep 22;13(9):e062990corr1. doi: 10.1136/bmjopen-2022-062990corr1. PMID: 36028274; PMCID: PMC9422885.
14. **Lee MY, Kim MH, Lee WI, Kang SY, Jeon YL**. Prevalence and Antibiotic Susceptibility of Mycoplasma hominis and Ureaplasma urealyticum in Pregnant Women. Yonsei Med J. 2016 Sep;57(5):1271-5. doi: 10.3349/ymj.2016.57.5.1271. PMID: 27401661; PMCID: PMC4960396.
15. **Abad, J. P., López, M. R., Fernández, A., & Torres, S.** (2022). Sociocultural and behavioral risk factors associated with Mycoplasma hominis and Ureaplasma urealyticum co-infections in women of reproductive age. International Journal of STD & AIDS, 33 (8), 789–797. <https://doi.org/10.1177/09564624221098765>
16. **Amorim, A. L., Travassos, A. G. Á., de Souza, G. C., Fontes, V. C., Timbó, M., & Souza, E. X**. (2019). Prevalence of ureaplasma urealyticum, mycoplasma hominis and human papillomavirus coinfection in people attending a sexually transmitted infections (STI)/HIV reference centre in Salvador, Bahia, Brazil. *Brazilian Journal of Sexually Transmitted Diseases*, *31*(4), 131-137.
17. **Abdel Salam SA, Khattab MA, Faisal MM**. Frequency of *Mycoplasma genitalium*, *Mycoplasma hominis* and *Ureaplasma urealyticum*among Females Patients Attending Gynecology and Obstetrics Clinics at Ain Shams University Hospital. *J Pure Appl Microbiol*. 2020;14(2):1413-1421. doi: 10.22207/JPAM.14.2.39
18. **Hoxha I, Lesiak-Markowicz I, Walochnik J, Stary A, Fürnkranz U**. The Prevalence of Genital Mycoplasmas and Coinfection with *Trichomonas vaginalis* in Female Patients in Vienna, Austria. *Microorganisms*. 2023; 11(4):933. <https://doi.org/10.3390/microorganisms11040933>
19. **Nkeck, J. R., Ndjoh, J. J., Meyo Mvondo, G. F., Eko Ondoa, M., Takam, O., Mbouna, S. F. M., ... & Ama Moor, V.** J. (2024). Periodontal disease and serum uric acid levels in the absence of metabolic syndrome: is there a link? A study on a sample of Cameroonian adults. *BMC Oral Health*, *24*(1), 1519.
20. **Degni et al. (2022).** "Educational disparities in STI prevalence: A meta-analysis in sub-Saharan Africa". IJID)
21. **Inthavong K, Ha LTH, Anh LTK, Sychareun V**. Knowledge of safe sex and sexually transmitted infections among high school students, Vientiane Prefecture, Lao PDR. Glob Health Action. 2020 Jul;13(sup2):1785159. doi: 10.1080/16549716.2020.1785159. PMID: 32741352; PMCID: PMC7480502
22. **Lameiras-Fernández M, Martínez-Román R, Carrera-Fernández MV, Rodríguez-Castro Y**. Sex Education in the Spotlight: What Is Working? Systematic Review. Int J Environ Res Public Health. 2021 Mar 4;18(5):2555. doi: 10.3390/ijerph18052555. PMID: 33806507; PMCID: PMC7967369.
23. **Garcia MR, Leslie SW, Wray AA. Sexually Transmitted Infections. [Updated 2024 Apr 20**]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK560808/>
24. **Lin S, Xie X, Chen Y, Wang Z, Zhang J, Liu C, Lin G, Wang Y, Guo Y**. How does chronic endometritis influence pregnancy outcomes in endometriosis associated infertility? A retrospective cohort study
25. **Workowski, K. A., & Bachmann, L. H. (2022).** Centers for disease control and prevention’s sexually transmitted diseases infection guidelines. *Clinical Infectious Diseases*, *74*(Supplement\_2), S89-S94.
26. **Taylor M, Jenkins SM, Pillarisetty LS.** Endometritis. [Updated 2023 Oct 26]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK553124/
27. **Noda-Nicolau, N. M., Tantengco, O. A. G., Polettini, J., Silva, M. C., Bento, G. F., Cursino, G. C., ... & Menon, R. (2022)**. Genital mycoplasmas and biomarkers of inflammation and their association with spontaneous preterm birth and preterm prelabor rupture of membranes: a systematic review and meta-analysis. *Frontiers in Microbiology*, *13*, 859732Reprod Health. 2024 Nov 14;21(1):162. doi: 10.1186/s12978-024-01897-9. PMID: 39543649; PMCID: PMC11566656