Prevalence and associated risk factors of *Mycoplasma genitalium* infection in women in Western Cameroon: A cross sectional study

Sunil Sethi, Gomseu Djoumsie Emmanuel Boris[1], Nandita Sharma, Rimjhim Kanaujia[2], Kuiate Jules Roger[1], Tamokou Jean de Dieu[1]

Department of Medical Microbiology, Post Graduate Institute of Medical Education and Research, Chandigarh, [1]Research Unit of Microbiology and Antimicrobial Substances, University of Dschang, Dschang, Cameroon, [2]Department of Microbiology, Punjab Institute of Liver and Biliary Sciences, Mohali, Punjab India.

Abstract

Background: *Mycoplasma genitalium* is implicated in genitourinary disorders in both men and women as a sexually transmitted infection (STI). This study aimed to ascertain the prevalence of *M. genitalium* and identify associated risk factors among women.

Aim: To investigate the prevalence of *M. genitalium* and identify various risk-factors associated with *M. genitalium* infection in women attending the clinic in Western Cameroon.

Methods: A cross-sectional study was conducted in hospitals from five districts of Western Cameroon on sexually active and non-menstruating women attending for antenatal, prenuptial and contraception consultations,between January 2020 and July 2020. Endocervical swabs (n = 680) were collected, and *M. genitalium* was detected using real-time PCR targeting the MgPa and pdhD genes.

Results: A total of 680 women, characterised by a mean age of 27.4 ± 7.5 years, were included in this study. The overall prevalence of the *M. genitalium* infection was 5.2%. Bivariate analysis revealed that having more than one sexual partner was independently associated with three times higher odds of prevalent *M. genitalium* infection (OR 2.9, 95% CI: 1.03-8.56).

Limitation: Cross-sectional design limits exploring temporal relationships with other STIs. Freezing specimens for a year until PCR testing may have compromised detection rates of *M. genitalium*.

Conclusion: This study contributes valuable data to the limited understanding of *M. genitalium* epidemiology. The findings may aid in the formulation of national clinical standards for testing and screening strategies, emphasising the importance of addressing associated risk factors in the targeted population.

Key words: *M. genitalium;* prevalence; condom; multiple sexual partner; Cameroon

Introduction

Mycoplasma genitalium has garnered attention as a cause for sexually transmitted infection (STI) in women genitourinary disorders. This STI could present with diverse symptoms, although the majority of *M. genitalium* infections remain asymptomatic. The burden of *M. genitalium* can be significant, particularly in terms of its impact on sexual and reproductive health. In low-risk women population in the United Kingdom

and United States, the prevalence of *M. genitalium* infection ranges from 1% to 2%, with the highest frequency observed among women aged 16–19 years.[1,2] However, in women attending STI clinics, the prevalence significantly escalates, ranging from 7.0% to 19.2%.[3,4] Despite these global insights, there is a dearth of research on *M. genitalium* infections within the Cameroonian population, with a recent study from the southwestern region reporting a 7% prevalence among infertile women.[5] Consequently, a more comprehensive understanding of the spectrum of *M. genitalium* infections within the population is imperative for effective prevention and treatment strategies. We carried out this study in Western Cameroon to investigate the prevalence of *M. genitalium* and identify various correlates and factors associated with *M. genitalium* infection in women attending the clinic.

Material and Methods

A cross-sectional study was conducted in hospitals of five districts of Western Cameroon (Dschang, Bafang, Mbouda, Bafoussam and Bangangte) including women attending for antenatal, prenuptial and contraception consultations between January 2020 and July 2020. Participants who provided consent were administered a questionnaire to collect sociodemographic information and assess potential risk factors. This study was approved by the Institutional Review Board (IRB), and written informed consent was obtained from all subjects. Participants included in the study were more than 18 years old, had no sexual contact in the last 48 hours, and had not received antibiotic treatment in the last 30 days. Individuals not meeting these criteria were excluded from the study. A total of 680 endocervical swabs (ECS) were obtained from women using a sterile speculum and a nonabrasive Bactopick Swab. Collected samples were stored in tubes containing 1 mL of sterile saline (0.9% NaCl) and preserved at –20°C until further processing.[6] The DNA from the ECS was extracted using the QIAamp DNA mini kit (Qiagen, CA, USA) as per manufacturer's instructions including 200 µL of nuclease free water as DNA extraction control. DNA thus extracted was stored at –20°C till further use. The *M. genitalium* was detected by real-time PCR for the MgPa and pdhD genes of *M. genitalium* using the primers mentioned in Supplementary Table 1. The qPCR amplification was performed in a 20 µL reaction volume containing 10 µL of SYBR green Master Mix (Invitrogen), 0.5 µM of each primer and 5 µL of DNA in C1000 Thermal cycler (Bio-Rad Laboratories, USA). The PCR conditions for performing amplification were as per the previous study by Jensen *et al*.[7,8] Data analysis was performed using Statistical Package for the Social Sciences (SPSS) 25.0 for Mac OS (SPSS, Inc., Chicago, IL, USA). Categorical variables were assessed by χ^2 test, and continuous variables by the Wilcoxon–Mann–Whitney test. $p < 0.05$ was considered statistically significant.

Results

The study was conducted in five district hospitals in the West region of Cameroon.. These hospitals include Dschang (235 women), Bafang (110 women), Mbouda (123 women), Bafoussam (109 women) and Bangangté (103 women). A total of 680 women ECS samples, with a mean age of 27.4 ± 7.5 years (range: 18–49 years), were included in the study. The population comprised 50.7% (n = 347) in the age group of less than 25 years and 49.3% (n = 333) in the age group of more than 25 years. Predominantly, the population belonged to the Semi Bantu race/ethnicity (93.3%, n = 638), followed by Bantu (4.4%, n = 30) and Soudano sao (1.8%, n = 12). A significant proportion of the population (85.2%, n = 583) demonstrated knowledge of STI transmission. Regarding relationship status, 61.7% (n = 422) were in monogamous relationships, while 25.7% (n = 176) were in polygamous relationships. The age of first sexual intercourse varied, with 50% (n = 347) reporting initiation between 15 and 17 years, 44.7% (n = 306) after 18 years, and 3.9% (n = 27) before 15 years [Table 1]. The overall prevalence of *M. genitalium* infection was 5.2% being highest among women aged less than 25 years (n = 22, 62.9%) comprising the majority. The overall prevalence of *M. genitalium* infection was 5.2% and <25 years accounts for 62.9% of the total prevalence. Furthermore, lack of prior education and knowledge of STI-related infections and higher age at first intercourse (>18 years) were not statistically significant, but the 1.5 times higher odds suggest a risk of *M. genitalium* infection. We observed, having more than one sexual partner was significantly associated with three times higher prevalence of *M. genitalium* infection (p value: 0.043, OR: 2.9; CI 1.1–8.5) [Table 2].

Discussion

STIs pose a significant burden on individuals, communities and healthcare systems. This study holds potential as we tested a significant number of women in Western Cameroon, where *M. genitalium* testing is not performed routinely to provide data on the epidemiology of *M. genitalium* relative to other STIs. In our study, the prevalence of *M. genitalium* was 5.2%, aligning with rates reported in various regions. For instance, Andersen *et al*. reported a prevalence of 2.3% among Danish women, while a study from South Africa found a higher prevalence of 9.6% among asymptomatic adolescents and young women.[9,10] A meta-analysis demonstrated even lower prevalence estimates in asymptomatic patients (0.8%), indicating variability across populations.[11] The differences in prevalence across countries underscore the impact of factors such as sampling methods, target demographics, specimen collection and detection techniques. Previous studies from Western Cameroon region have primarily focused on other genital mycoplasmas (*Ureaplasma urealiticum* and *Mycoplasma hominis*) infection, neglecting *M. genitalium*.[12,13] Our study addresses this gap by providing data on *M. genitalium* prevalence and associated risk factors in the region. On comparing findings of our study with previous studies from the same region, we noted variations in prevalence rates. Pepin *et al.* observed a prevalence of 26.3% among West African female-sex workers, which is

Table 1: Sociodemographic, sexual-behavioural and clinical features associated with *Mycoplasma genitalium* among women in Cameroon

Parameter	*M. genitalium* negative (n = 645) (%)	*M. genitalium* positive (n = 35) (%)	P value
Sociodemographic characteristics			
Age			
<25 years	325 (50.4)	22 (62.9)	0.167
>25 years	320 (49.6)	13 (37.1)	
Race/Ethnic Group			
Bantu	606 (94.0)	32 (91.4)	0.813
Semi Bantu	28 (4.3)	2 (5.7)	
Saudano Sau	11 (1.7)	1 (2.9)	
Education			0.808
No education	76 (11.8)	5 (14.3)	
Secondary education	335 (51.9)	19 (54.3)	
University	234 (36.3)	11 (31.4)	
Profession			0.212
Student	188 (29.1)	9 (25.7)	
Trader	79 (12.2)	8 (22.9)	
Farmer	85 (13.2)	2 (5.7)	
Others	293 (45.4)	16 (45.4)	
Marital status			0.635
Single	128 (19.8)	9 (25.7)	
Living apart	144 (22.3)	11 (31.4)	
Married	241 (37.4)	9 (25.7)	
Concubinage	126 (19.5)	6 (17.1)	
Divorced	4 (0.6)	0 (0)	
Widow	2 (0.3)	0 (0)	
Type of family			0.500
Monogamy	169 (26.2)	7 (20)	
Polygamy	79 (12.2)	3 (8.6)	
Sexual-behavioural characteristics			
Age at first sexual intercourse			0.206
15–17 years	332 (51.5)	15 (42.9)	
<15 years	27 (4.2)	0 (0)	
>18 years	286 (44.3)	20 (57.1)	
Knowledge of STI			
No	90 (14)	7 (20)	0.320
Yes	555 (86.0)	28 (80.0)	
Previously infected with STI			0.061
No	475 (73.6)	21 (60)	
Yes	170 (26.4)	14 (40)	
Number of sexual partner			**0.032***
One	466 (72.2)	31 (88.6)	
More than one	179 (27.8)	4 (11.4)	
Usage of condom			0.135
Always	306 (47.4)	22 (62.9)	
Occasionally	272 (42.2)	12 (34.3)	
No	67 (10.4)	1 (2.9)	
Age at first alcohol consumption			0.481
No	319 (49.5)	20 (57.1)	
15–17 years	124 (19.2)	4 (11.4)	
>18 years	202 (31.3)	11 (31.4)	
Smoking			0.200
No	420 (65.1)	27 (77.1)	
Yes	225 (34.9)	8 (22.9)	

STI: Sexually transmitted infections, *p value: <0.05 is significant.

Table 2: Binary logistic regression analysis demonstrating sociodemographic, sexual-behavioural and clinical features associated with *Mycoplasma genitalium*

	M. genitalium positive	p value	Odd's Ratio[#] (95% CI)
Sociodemographic characteristics			
Age			
<25 years	22 (62.9%)	0.154	1.666 (0.825–3.365)
>25 years	13 (37.1%)		1
Race/Ethnic Group			
Bantu	32 (91.4%)	0.816	1
Semi Bantu	2 (5.7%)	0.608	0.581 (0.73–4.639)
Saudano Sau	1 (2.9%)	0.850	0.786 (0.065–9.569)
Education			
No education	5 (14.3%)	0.809	1
Secondary education	19 (54.3%)	0.545	1.400 (0.471–4.156)
University	11 (31.4%)	0.629	1.207 (0.564–2.583)
Type of family			
Monogamy	7 (20%)	0.268	0.735 (0.426–1.268)
Polygamy	3 (8.6%)		1
Sexual-behavioural characteristics			
Age at first sexual intercourse			
15–17 years	15 (42.9%)	0.461	ref
<15 years	0 (0%)	0.998	-
>18 years	20 (57.1%)	0.213	1.548 (0.778–3.079)
Knowledge of STI			
Yes	28 (80.0%)		1
No	7 (20%)	0.323	1.542 (0.654 – 3.635)
Previously infected with STI			
No	21 (60%)		1
Yes	14 (40%)	0.081	0.537 (0.267 – 1.080)
Number of sexual partner			
One	31 (88.6%)	0.043*	2.977 (1.036 – 8.554)
More than one	4 (11.4%)		1
Usage of condom			
Always	22 (62.9%)	0.163	1
Occasionally	12 (34.3%)	0.127	4.817 (0.638–36.362)
No	1 (2.9%)	0.302	2.956 (0.378–23.132)
Age at first alcohol consumption			
No	20 (57.1%)	0.491	1
15–17 years	4 (11.4%)	0.234	0.515 (0.172–1.535)
>18 years	11 (31.4%)	0.715	0.869 (0.408–1.851)
Smoking			
No	27 (77.1%)	ref	
Yes	8 (22.9%)	0.150	1.808 (0.808–4.046)

ref: reference; STI: sexually transmitted infections; *p value: <0.05 is significant. [#] Crude odds ratio.

very high in comparison to the current study, as this study included women participants who are primarily at high risk of acquiring STI.[14] Morency *et al.* observed 20% patients harbouring *M. genitalium* as an aetiological agent in the urethral discharge in Bangui, Central African Republic.[15] Our study was conducted among women participants attending hospital for the routine consultations. Thus, the prevalence

was low in our study in comparison to other studies reported from the same region. This data offers valuable insights into *M. genitalium* epidemiology in Western Cameroon.

Additionally, we explored associated risk factors by identifying factors contributing to *M. genitalium* infection. In this study, we explore the association of various sexual behavioural risk factors, for their association with *M. genitalium* infection. Although not significant, the majority of women in the *M. genitalium* positive group (62.9%) were <25 years. The link between young age and STI may be attributed to inconsistent condom use in younger women and/or a higher prevalence of STIs in adolescent males. While a few studies have found no evidence of a link between high-risk sexual behaviour and *M. genitalium,*[15,16] findings in studies involving women attending STI clinics highlight the influence of study populations.[17,18]

In the current study, the mean age of the first sexual intercourse was between 15 and 17 years in 50% of the women. This finding was consistent with other studies, where the mean age for first sexual contact was less than 20 years.[19,20] In the current study, odds of prevalent infection in the group less than 25 years age group was 1.7 times higher than that in the more than 25 years age group. Similar observations were made by Hancock *et al.*, where women less than 20 years were nearly twice as likely to have *M. genitalium* infection compared to older women.[21] The younger age group may be more likely to have sexual partners who have STIs, which increases their risk of infection.[22,23]

Bivariate analysis revealed that having more than one sexual partner was independently associated with three times higher odds of prevalent *M. genitalium* infection. Andersen *et al.* observed a similar trend, where women with more than 3 partners in the previous 6 months had significantly higher odds of infection.[9] However, Sena *et al.* reported no association between *M. genitalium* infection and high-risk activity, suggesting potential confounding factors such as age, race and socioeconomic status.[24]

In our study, non-usage or occasional use of condoms was not associated with prevalent *M. genitalium* infection respectively. However, Zhang *et al*, observed that use of a condom during all sexual encounters decreased chances of infection with *M. genitalium*.[25] On the contrary, a few studies reported that the regular condom use was not significantly protective against M. genitalium infection.[9,19] This indicates potential limitations in the efficacy of condoms against *M. genitalium* compared to other STIs. It is important to note that condom use may not provide complete protection against *M. genitalium* infection, as the bacteria can be transmitted through non-penetrative sexual contact routes.

Limitations

The present study is subject to several limitations. First, the cross-sectional approach prevents the investigation of temporal relationships between risk behaviours, HIV/STI

and *M. genitalium*. Second, the freezing of *M. genitalium* specimens for approximately one year until PCR testing, may have reduced the detection rate.

Conclusion

This study holds significance as it was conducted on a large number of women in Western Cameroon, where routine *M. genitalium* testing is not a standard practice, thereby offering valuable epidemiological data concerning *M. genitalium*. Consequently, our findings contribute to the limited body of knowledge on *M. genitalium* epidemiology and may play a role in formulating national clinical standards for testing and screening strategies.

Ethical approval

The research/study was approved by the Institutional Review Board at Institutional Ethics Committees, PGIMER, Chandigarh (Ethics approval no IEC-05/2020-1670) and Institutional Ethics Committees, University of Dschang, Dschang, Cameroon (Ethics approval no. N02018/05/1022/CE/ CNERSH/SP), dated 2020.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

References

1. McGowin CL, Anderson-Smits C. Mycoplasma genitalium: An emerging cause of sexually transmitted disease in women. PLoS Pathog 2011;7:e1001324.
2. Sonnenberg P, Ison CA, Clifton S, Field N, Tanton C, Soldan K, *et al.* Epidemiology of mycoplasma genitalium in British men and women aged 16-44 years: Evidence from the third national survey of sexual attitudes and lifestyles (Natsal-3). Int J Epidemiol 2015;44:1982–94.
3. Mobley VL, Hobbs MM, Lau K, Weinbaum BS, Getman DK, Seña AC. Mycoplasma genitalium infection in women attending a sexually transmitted infection clinic: Diagnostic specimen type, coinfections, and predictors. Sex Transm Dis 2012;39:706–9.
4. Gaydos C, Maldeis NE, Hardick A, Hardick J, Quinn TC. Mycoplasma genitalium as a contributor to the multiple etiologies of cervicitis in women attending sexually transmitted disease clinics. Sex Transm Dis 2009;36:598–606.
5. Mbah CE, Jasani A, Aaron KJ, Akoachere JF, Tita ATN, Geisler WM, *et al.* Association between chlamydia trachomatis, Neisseria gonorrhoeae, Mycoplasma genitalium, and Trichomonas vaginalis and secondary infertility in Cameroon: A case-control study. PLoS One 2022;17:e0263186.
6. Detailed STD Facts - Chlamydia. Available from: https://www.cdc.gov/std/chlamydia/stdfact-chlamydia-detailed.htm. [Last accessed on 2023 Mar 11].
7. Müller EE, Venter JME, Magooa MP, Morrison C, Lewis DA, Mavedzenge SN. Development of a rotor-gene real-time PCR assay for the detection and quantification of Mycoplasma genitalium. J Microbiol Methods 2012;88:311–5.
8. Jensen JS, Uldum SA, Sondergard-Andersen J, Vuust J, Lind K. Polymerase chain reaction for detection of Mycoplasma genitalium in clinical samples. J Clin Microbiol 1991;29:46–50.
9. Andersen B, Sokolowski I, Østergaard L, Møller JK, Olesen F, Jensen JS. Mycoplasma genitalium: Prevalence and behavioural risk factors in the general population. Sex Transm Infect 2007;83:237.
10. Kaida A, Dietrich JJ, Laher F, Beksinska M, Jaggernath M, Bardsley M, *et al.* A high burden of asymptomatic genital tract infections undermines the syndromic management approach among adolescents and young adults in South Africa: Implications for HIV prevention efforts. BMC Infect Dis 2018;18.
11. Baumann L, Cina M, Egli-Gany D, Goutaki M, Halbeisen FS, Lohrer GR, *et al.* Prevalence of Mycoplasma genitalium in different population groups: systematic review and meta-analysis. Sex Transm Infect 2018;94:255.
12. Njunda AL, Nsagha DS, Assob JCN, Palle JN, Kamga HL, Nde PF, *et al.* Genital mycoplasmas in women attending the Yaoundé University Teaching Hospital in Cameroon. J Public Health Afr [Internet]. 2011 [cited 2024 Apr 29];2:68–71. Available from: /pmc/articles/PMC5345475/
13. Djifack Tadongfack T, Lydia I, Nitcheu S, Roger F, Keubo N, Mutarambirwa HD, et al. Epidemiology, Prevalence and Antimicrobial Susceptibility of Sexually Transmitted Mycoplasma hominis and Ureaplasma urealyticum Infections in Dschang, West Cameroon. Microbiol Res J Int [Internet]. 2020 [cited 2024 Apr 29];30:19–29. Available from: https://journalmrji.com/index.php/MRJI/article/view/1154
14. Pépin J, Labbé AC, Khonde N, Deslandes S, Alary M, Dzokoto A, *et al.* Mycoplasma qenitalium: an organism commonly associated with cervicitis among west African sex workers. Sex Transm Infect 2005;81:67–72.
15. Morency P, Dubois MJ, Grésenguet G, Frost E, Mâsse B, Deslandes S, et al. Aetiology of urethral discharge in Bangui, Central African Republic. Sex Transm Infect [Internet]. 2001 [cited 2024 Jun 3];77:125. Available from: /pmc/articles/PMC1744284/?report=abstract
16. Vandepitte J, Muller E, Bukenya J, Nakubulwa S, Kyakuwa N, Buvé A, *et al.* Prevalence and correlates of Mycoplasma genitalium infection among female sex workers in Kampala, Uganda. J Infect Dis 2012;205:289–96.
17. Oakeshott P, Aghaizu A, Hay P, Reid F, Kerry S, Atherton H, *et al.* Is Mycoplasma genitalium in women the 'new chlamydia?' A community-based prospective cohort study. Clin Infect Dis 2010;51:1160–6.
18. Manhart LE, Critchlow CW, Holmes KK, Dutro SM, Eschenbach DA, Stevens CE, *et al.* Mucopurulent cervicitis and Mycoplasma genitalium. J Infect Dis 2003;187:650–7.
19. Chra P, Papaparaskevas J, Papadogeorgaki E, Panos G, Leontsinidis M, Arsenis G, *et al.* Prevalence of Mycoplasma genitalium and other sexually-transmitted pathogens among high-risk individuals in Greece. Germs 2018;8:12–20.
20. Gomih-Alakija A, Ting J, Mugo N, Kwatampora J, Getman D, Chitwa M, *et al.* Clinical characteristics associated with Mycoplasma genitalium among female sex workers in nairobi, Kenya. J Clin Microbiol 2014;52:3660.
21. Hancock EB, Manhart LE, Nelson SJ, Kerani R, Wroblewski JKH, Totten PA. Comprehensive assessment of sociodemographic and behavioral risk factors for Mycoplasma genitalium infection in women. Sex Transm Dis 2010;37:777.
22. Yavorsky RL, Hollman D, Steever J, Soghomonian C, Diaz A, Strickler H, *et al.* Prevalence of sexually transmitted infections in at-risk

adolescent females at a comprehensive, stand-alone adolescent health center in New York City. Clin Pediatr (Phila) 2014;53:890–5.

23. Risser WL, Bortot AT, Benjamins LJ, Feldmann JM, Barratt MS, Eissa MA, *et al*. The epidemiology of sexually transmitted infections in adolescents. Semin Pediatr Infect Dis 2005;16:160–7.

24. Seña AC, Lee JY, Schwebke J, Philip SS, Wiesenfeld HC, Rompalo AM, *et al*. A silent epidemic: The prevalence, incidence and persistence of mycoplasma genitalium among young, asymptomatic high-risk women in the United States. Clin Infect Dis 2018;67:73–9.

25. Zhang XH, Zhao PZ, Ke WJ, Wang LY, Tso LS, Chen ZY, *et al*. Prevalence and correlates of Mycoplasma genitalium infection among patients attending a sexually transmitted infection clinic in Guangdong, China: A cross-sectional study. BMC Infect Dis 2021;21:649.