Original article

UDC: 618-022.7:618-002.828
doi: 10.5633/amm.2024.0208

THE FREQUENCY OF INFECTIONS WITH *UREAPLASMA UREALYTICUM* AND *MYCOPLASMA HOMINIS* AND THEIR CORRELATION WITH POSITIVE RESULTS FOR *CANDIDA* SPECIES IN PREGNANT AND NON-PREGNANT WOMEN

Dejan Mihajlović[1], Aleksandra Ilić[2], Verica Minić[3], Milica Milentijević[1,2], Momir Dunjić[2]

Mycoplasma hominis, Ureaplasma urealytium and *Candida species (Candida* spp.) are potentially pathogenic strains of microorganisms that can often be found in the genital tract of healthy women. However, the mentioned strains with additional factors can lead to numerous complications. The research aimed to determine the one-year prevalence of infection with *Mycoplasma* and *Ureaplasma* in pregnant and non-pregnant patients, as well as the correlation of infection with *Candida* spp. The study included 206 outpatients 30.8 ± 7 years of average age treated for symptoms of vaginal infection at the Department of Gynaecology and Obstetrics of the Clinical Hospital Center of Kosovska Mitrovica. All patients were tested for *Mycoplasma* and *Ureaplasma* by taking a standard vaginal and cervical smear. Cultures were seeded according to standard protocols. Out of 206 patients, 71 were pregnant. A positive test for *Mycoplasma* was found in 32 patients, *Ureaplasma* in 96, and 52 patients in the entire sample had vaginal candidiasis. Six pregnant women were positive for *Mycoplasma* and 29 for Ureaplasma. Vaginal candidiasis was significantly more common in pregnant patients compared to non-pregnant patients (n = 40, p = 0.046). *Ureaplasma* infection was associated with candidiasis in 33 patients (p = 0.005). Almost half of the patients (46.6%) tested positive for *Ureaplasma*. In pregnant women, the most common infection was with *Candida* spp. *Ureaplasma* infection was often associated with vaginal candidiasis in the entire sample, and one should be careful in the treatment of these infections and rationally use antibiotics in correlation with the clinical findings with preventive use of vaginal antimycotics.

Acta Medica Medianae 2024;63(2):63-68.

Key words: *Ureaplasma urealyticum, Mycoplasma hominis, Candida species*

[1]Clinical Health Center Kosovska Mitrovica, Department for Gynecology and Obstetrics, Kosovska Mitrovica, Serbia
[2]University of Pristina temporary placed in Kosovska Mitrovica, Faculty of Medicine, Kosovska Mitrovica, Serbia
[3]Institute for Public Health Pristina, temporary placed in Kosovska Mitrovica, Kosovska Mitrovica, Serbia

Contact: Dejan Mihajlović
26 Stojana Protića st, 11000 Belgrade, Serbia
E-mail: dejan.mihajlovic@med.pr.ac.rs

Introduction

Vaginal microflora is a specific compartment of the normal flora of the human organism (1). It is mainly composed of lactobacilli (> 70%) that use glycogen as a substrate for the creation of lactic acid, which gives the vagina a specific acidic environment, which is generally around 4.5. All this happens in the presence of estrogen (2). For various reasons, there may be changes in the pH of the vaginal environment and infection may occur. Symptoms of vaginal infections are one of the most common reasons women visit the doctor (3). Vaginal infections can be caused by all microorganisms that can also be inhabitants of normal vaginal flora. One of the most common causes of infection is *Candida* spp. which occurs in 70% of women at least once in their life and can greatly affect the quality of life (4). In addition, genital mycoplasmas are often isolated as causative agents of infection (5). The most frequently isolated are M. *hominis* and U. *urealyticum*, which represent cell-free prokaryotes that are obligate parasites but also conditionally pathogenic. Genital mycoplasma infections can be asymptomatic, but they can also lead to serious complications, which is why their detection is very important, especially during pregnancy and the period before conception. They can cause, in addition to the mentioned vaginitis and cervicitis, vaginosis, spontaneous premature birth,

chorioamnionitis, spontaneous abortion, ectopic pregnancy and infertility (6, 7).

Our research aimed to examine the prevalence of infection with M. *hominis*, U. *urealyticum* as well as their relationship with *Candida albicans* infection in pregnant and non-pregnant patients of the Kosovska Mitrovica Health Centre.

Material and Method

The research included 206 pregnant and non-pregnant outpatient women with symptoms of vaginal infection, average age 31.8 ± 7.3 years (min 19, max 56), treated at the Department of Gynaecology and Obstetrics of the Clinical Health Center Kosovska Mitrovica in the period from June to December 2022.

All patients were informed that their brief anamnestic data, as well as the results of vaginal and cervical smears, would be used for the purpose of a cross-sectional epidemiological study and would not be used for other purposes.

All women were tested for genital mycoplasmas by taking a standard vaginal and cervical smear with monitoring the frequency of *Candida* spp. Cultures were seeded according to standard protocols. The culture of samples for *Candida* was performed on Saburo agar while testing for *Mycoplasma* and *Ureaplasma* was performed with the commercial Mycoview Quantum test. We considered a number > 104 as a positive result, and for Candida, a significant number and more.

Of the statistical methods, absolute and relative numbers were used, and the method for testing statistical hypotheses was the chi-square test.

Results

Of the 206 women, 135 were non-pregnant women and 71 were pregnant women, as we can see in Figure 1.

In Figure 2, we can see the frequency of infections in the entire sample with the highest frequency of *Ureaplasma* infection.

In Figure 3, we can see the frequency of infections in relation to pregnancy shown in absolute numbers.

A positive test for *C. albicans* was statistically significantly more common in pregnant women than in non-pregnant women. (chi-square = 3.995, p = 0.046)

In Table 1, we can see the correlation of a positive test for *Ureaplasma* with vaginal candidiasis

C. albicans was statistically significantly more common in women with *Ureaplasma* infection in the entire sample (chi-square 7.9, p = 0.005).

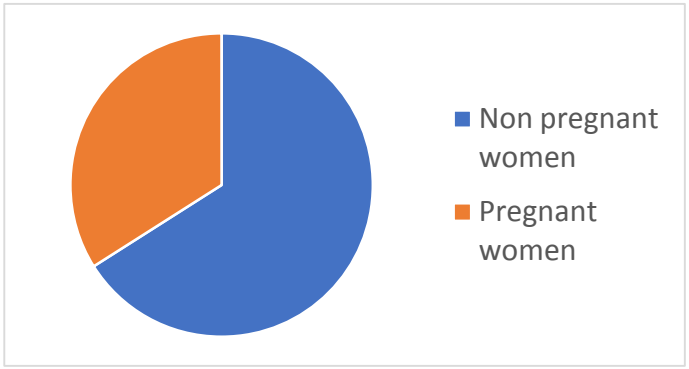

Figure 1. Distribution of female patients in relation to pregnancy

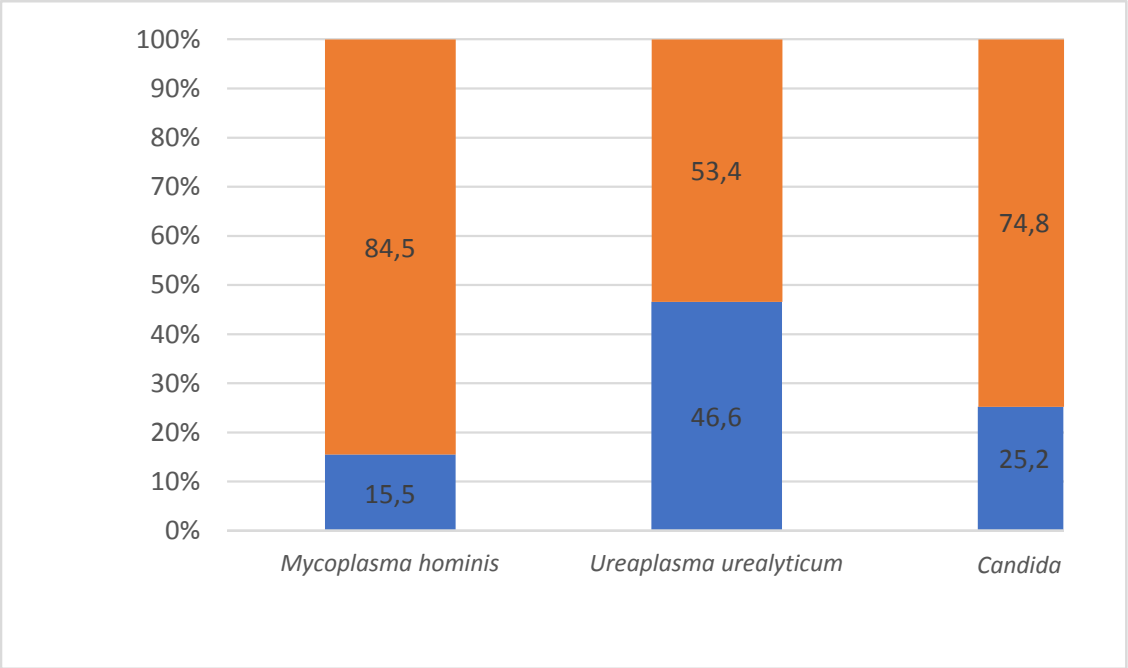

Figure 2. Frequency determination of infections in the entire sample shows the highest frequency of *Ureaplasma* infection

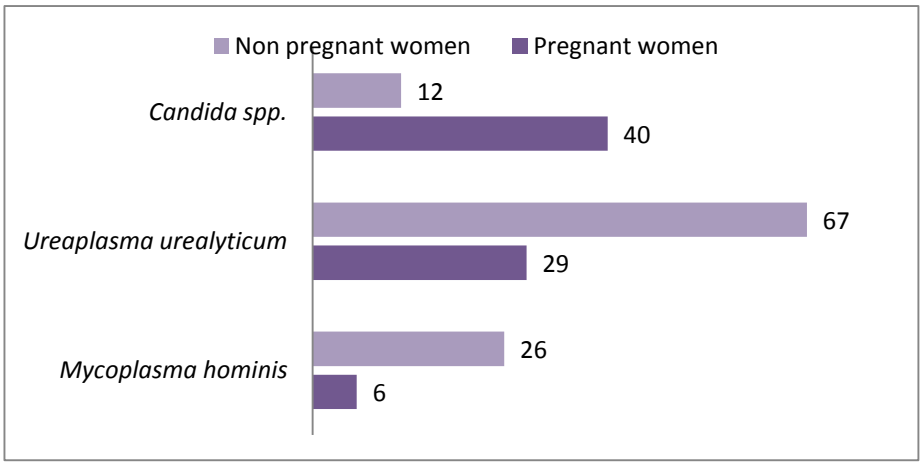

Figure 3. Frequency of infections in relation to pregnancy shown in absolute numbers

Table 1. Correlation of positive findings for ureaplasma with vaginal candidiasis in the entire sample

			Candida spp.		Total
			Negative	Positive	
Ureaplasma urealyticum	Negative		91	19	110
			59.1%	36.5%	53.4%
	Positive		63	**33**	96
			40.9%	**63.5%**	46.6%
Total			154	52	206
			100.0%	100.0%	100.0%

Discussion

Our results show that vaginal infections with proven pathogens are extremely common and their timely diagnosis is essential to avoid persistent infection and subsequent complications previously listed. U. *urealyticum* infection in our sample was present in 46% of the tested women, which is more compared to several multicenter studies from different countries that showed that *Ureaplasma* was present in about 35% of tested subjects and *Mycoplasma* in 10%. This can be explained by the larger number of respondents and the different methodology of the examination (8, 9, 10). Epidemiological data related to *C. albicans* infection show that its frequency does not change much over the years in different parts of the world and that it amounts to somewhere around 40%, which is slightly higher compared to our sample because we tested only women with symptoms of vaginal infection, and *Candida* can often be isolated even in women who do not have symptoms (11, 12). The results of infection with *Ureaplasma* and *Candida* are in accordance with data from the literature where the frequency of Ureaplasma is slightly lower than infection with *Candida*, Payne et al. showed this through research using the real-time PCR method and showed the impact of these infections on pregnancy (13). In 2016, Jovanović et al. conducted a survey of the frequency of vaginal infections in pregnancy and found that one of the most common causes is *C. albicans* and that its prevalence increases during pregnancy by about 30%, which is in line with our results. In our sample, *Candida* was significantly more common in pregnancy than in non-pregnant women, and we can explain this by a change in the immune status as well as changes in the hormonal milieu (14).

The limitations of our research are a short follow-up period, as well as a smaller number of respondents. In future research, it is necessary to extend the duration of the study, and therefore to increase the number of respondents in order to confirm or supplement the findings obtained in this research.

Given that other factors, such as previous conditions and current chronic diseases, were not examined, the findings from this research can serve as a starting point for a future prospective study that would examine the importance of infections as well as their many complications.

Regardless, the high percentage of women who tested positive for genital infections in such a short period in a relatively small area speaks of the importance of this research.

Conclusion

Considering our results, every symptomatic vaginal infection with an adequate clinical picture should be tested for genital *Mycoplasmas* and adequately treated. Considering the frequent association of genital mycoplasma infection with vaginal candidiasis, care should be taken in treatment and vaginal probiotics must be prescribed to prevent further colonization by *C albicans.*

References

1. Buchta V. Vaginal microbiome. Ceska Gynekol 2018;83(5):371-379. [PubMed]
2. Godha K, Tucker KM, Biehl C, Archer DF, Mirkin S. Human vaginal pH and microbiota: an update. Gynecol Endocrinol 2018; 34(6): 451-455. [CrossRef][PubMed]
3. Mashburn J. Vaginal infections update. J Midwifery Womens Health 2012; 57(6): 629-634. [CrossRef][PubMed]
4. Hong E, Dixit S, Fidel PL, Bradford J, Fischer G. Vulvovaginal candidiasis as a chronic disease: diagnostic criteria and definition. J Low Genit Tract Dis 2014; 18(1): 31-8. [CrossRef][PubMed]
5. Leli C, Mencacci A, Latino MA, Clerici P, Rassu M, Perito S, et al. Prevalence of cervical colonization by Ureaplasma parvum, Ureaplasma urealyticum, Mycoplasma hominis and Mycoplasma genitalium in childbearing age women by a commercially available multiplex real-time PCR: An Italian observational multicentre study. J Microbiol Immunol Infect 2018; 51(2): 220-225. [CrossRef][PubMed]
6. Rittenschober-Böhm J, Waldhoer T, Schulz SM, Pimpel B, Goeral K, Kasper DC, Witt A, Berger A. Vaginal Ureaplasma parvum serovars and spontaneous preterm birth. Am J Obstet Gynecol 2019; 220(6): 594.e1-594.e9. [CrossRef][PubMed]
7. Liang XD, Gu TT, Wang JL, Cui H, Wei LH. [Relationship between ureaplasma urealyticum infection and ectopic pregnancy]. Zhonghua Fu Chan Ke Za Zhi 2007; 42(6): 370-3. Chinese. [PubMed]
8. Leli C, Mencacci A, Latino MA Clerici P, Rassu M, Perito S et al. Prevalence of cervical colonization by Ureaplasma parvum, Ureaplasma urealyticum, Mycoplasma hominis and Mycoplasma genitalium in childbearing age women by a commercially available multiplex real-time PCR: An Italian observational multicentre study. J Microbiol Immunol Infect 2018; 51(2): 220-225. [CrossRef][PubMed]
9. Bayraktar MR, Ozerol IH, Gucluer N, Celik O. Prevalence and antibiotic susceptibility of Mycoplasma hominis and Ureaplasma urealyticum in pregnant women. Int J Infect Dis 2010; 14(2): e90-5. [CrossRef][PubMed]
10. Sobouti B, Fallah S, Mobayen M, Noorbakhsh S, Ghavami Y. Colonization of Mycoplasma hominis and Ureaplasma urealyticum in pregnant women and their transmission to offspring. Iran J Microbiol 2014; 6(4): 219-224.[PubMed]
11. Gonçalves B, Ferreira C, Alves CT, Henriques M, Azeredo J, Silva S. Vulvovaginal candidiasis: Epidemiology, microbiology and risk factors. Crit Rev Microbiol 2016; 42(6): 905-27. [CrossRef][PubMed]
12. Blostein F, Levin-Sparenberg E, Wagner J, Foxman B. Recurrent vulvovaginal candidiasis. Ann Epidemiol 2017; 27(9): 575-582.e3. [CrossRef][PubMed]
13. Payne MS, Ireland DJ, Watts R, Nathan EA, Furfaro LL, Kemp MW, et al. Ureaplasma parvum genotype, combined vaginal colonisation with Candida albicans, and spontaneous preterm birth in an Australian cohort of pregnant women. BMC Pregnancy Childbirth 2016; 16(1): 312. [CrossRef][PubMed]
14. Jovanović M, Lukač A, Sulović N, Ilić A, Kapetanović S. Najučestalije vaginalne infekcije kod trudnica na teritoriji opštine Gračanica u periodu 2013-2014. godina. Praxis medica 2016; 45(1): 53-55.

Originalni rad

UDC: 618-022.7:618-002.828
doi: 10.5633/amm.2024.0208

UČESTALOST INFEKCIJA BAKTERIJAMA *UREAPLASMA UREALYTICUM I MYCOPLASMA HOMINIS* I NJIHOVA KORELACIJA SA POZITIVNIM NALAZOM NA GLJIVICU *CANDIDA SPECIES* KOD TRUDNICA I ŽENA KOJE NISU TRUDNE

Dejan Mihajlović[1], Aleksandra Ilić[2], Verica Minić[3], Milica Milentijević[1,2], Momir Dunjić[2]

[1]Kliničko-bolnički centar Kosovska Mitrovica, Odeljenje ginekologije i akušerstva, Kosovska Mitrovica, Srbija
[2]Univerzitet u Prištini sa privremenim sedištem u Kosovskoj Mitrovici, Medicinski fakultet, Kosovska Mitrovica, Srbija
[3]Zavod za javno zdravlje Priština sa privremenim sedištem u Kosovskoj Mitrovici, Kosovska Mitrovica, Srbija

Kontakt: Dejan Mihajlović
Stojana Protića 26, 11000 Beograd, Srbija
E-mail: dejan.mihajlovic@med.pr.ac.rs

Mycoplasma hominis, Ureaplasma urealytium i *Candida species (Candida* spp.) predstavljaju potencijalno patogene sojeve bakterija koji se često mogu naći u genitalnom traktu zdravih žena. Međutim, pomenuti sojevi uz dodatne faktore mogu dovesti do mnogobrojnih komplikacija. Cilj istraživanja bio je da se utvrdi jednogodišnja prevalencija infekcije mikoplazmom i ureaplazmom kod trudnica i žena koje nisu trudne, kao i korelacija sa infekcijom glijivicom *Candida* spp. U istraživanje je bilo uključeno 206 ambulantno lečenih žena sa simptomima vaginalne infekcije, prosečne starosti 30,8 godina ± 7 godina, koje su bile lečene na Odeljenju ginekologije i akušerstva Kliničko-bolničkog centra u Kosovskoj Mitrovici. Sve žene bile su testirane na mikoplazmu i ureaplazmu, uz uzimanje standardnog vaginalnog i cervikalnog brisa. Zasejavanje kultura izvedeno je po standardnim protokolima. Od 206 žena, 71 bila je trudna. Nalaz na mikoplazmu bio je pozitivan kod 32 žene, kod njih 96 nalaz na ureaplazmu bio je pozitivan, dok su vaginalnu kandidijazu imale 52 žene iz celog uzorka. Kod šest trudnica nalaz na mikoplazmu bio je pozitivan, a kod njih 29 nalaz na ureaplazmu bio je pozitivan. Vaginalna kandidijaza bila je značajno češća kod trudnica nego kod žena koje nisu bile trudne (n = 40; p = 0,046). Infekcija ureaplazmom bila je kod 33 bolesnice udružena sa kandidijazom (p = 0,005). Kod velikog broja testiranih žena i iz jedne i iz druge grupe nalaz na ureaplazmu bio je pozitivan. Kod trudnica je najčešća bila infekcija gljivicom *Candida* spp. Činjenica da je infekcija ureaplazmom često bila udružena sa vaginalnom kandidijazom u celom uzorku upućuje na to da treba biti oprezan u lečenju ovih infekcija i racionalno upotrebljavati antibiotike u skladu sa kliničkim nalazom i uz preventivnu upotrebu vaginalnih antimikotika.

Acta Medica Medianae 2024; 63(2):63-68.

***Ključne reči**: Ureaplasma urealyticum, Mycoplasma hominis, Candida species*