Ureaplasma urealyticum and *Mycoplasma hominis* infection in women with urogenital diseases

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Abstract

Purpose: The aim of the study was to assess the incidence of *Ureaplasma urealyticum* (*U. urealyticum*) and *Mycoplasma hominis* (*M. hominis*) infection in women with urogenital diseases.

Material and methods: *M. hominis* and *U. urealyticum* was assessed in 541 women from gynaecological and STD outpatient clinics, aged 18-55 years. A Mycoplasma IST 2 kit was used for biochemical determination of mycoplasmal infections (BioMerieux). Additionally, 248 of patients were examined for *Chlamydia trachomatis* (*C. trachomatis*), *Trichomonas vaginalis* (*T. vaginalis*) and *Candida albicans* (*C. albicans*) infection. *C. trachomatis* was detected by direct immunofluorescence method. The standard culture methods (Biomed) were applied to detect *T. vaginalis* and *C. albicans*.

Results: *U. urealyticum* was detected in 161 (29.8%), and *M. hominis* in 20 (3.7%) women. *U. urealyticum* infection alone was observed in 37/79 (46.8%), and 1/8 (12.5%) patient had only *M. hominis* infection. The *U. urealyticum* infection showed most frequent coexistence with *C. albicans* (29.1%), and less frequent with *C. trachomatis* (13.9%) and *M. hominis* infection (10.1%). The highest percentage of mycoplasma-positive cultures was found in patients of STD clinic and in infertile women. In patients with ureaplasmal infection only the most common clinical symptom was vaginal discharge and vulval/vaginal irritation. In 8.1% of the women, the course of *U. urealyticum* infection was asymptomatic.

Conclusions: The incidence rate of genitourinary infections due to *U. urealyticum* was significantly higher as compared to *M. hominis* infection. Sexual mycoplasmal infections were most frequently reported in the group of patients of STD clinic and correlated with age and sexual activity.

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Introduction

The aim of the study was to assess the incidence of *Mycoplasma hominis* (*M. hominis*) and *Ureaplasma urealyticum* (*U. urealyticum*) in women with clinical symptoms of inflammation conditions of the genitourinary organ.

Mycoplasms constitute a large group of microorganisms, but only some, i.e. Mycoplasma and Ureaplasma species, are pathogenic for humans. So far detected in humans, they mainly inhabit the mucous membranes of the respiratory tract and genitourinary system. Three species have been isolated from the mucosal surfaces of the genitourinary tract: *M. hominis*, *U. urealyticum* and recently discovered *Mycoplasma genitalium* (*M. genitalium*) [1]. They are commonly referred to as "genital mycoplasms", as the infection occurs via sexual contacts.

The role of mycoplasms in aetiopathogenesis of inflammatory states of the genitourinary organ is still a subject of controversy. Their presence has been associated with the incidence of urethritis, vaginitis, cervicitis, pelvic inflammatory disease (PID) and pathology of pregnancy and newborns [2]. Mycoplasms are also known to be part of the comensal flora of the genitourinary tract mucosa and are found in the majority of sexually active humans [3,4].

Material and methods

The study group consisted of 541 women aged 18-55 years (mean 29.5 years), with clinical symptoms or suspected of genitourinary tract infection, who were referred to the Diagnostic-Research Centre of Sexually Transmitted Diseases (STD) from gynaecological and STD outpatient clinics in North-eastern Poland for microbiological diagnostics. The patients reported with the following diagnoses: vaginitis – 148, cervicitis with or

Table 1. **Detection of *M. hominis* and *U. urealyticum* in particular groups of studied women (n=541)**

Studied group	*M. hominis*		*U. urealyticum*	
	+ n (%)	- n (%)	+ n (%)	- n (%)
patients of STD clinic (n=22)	2 (9.1)	20 (90.9)	13 (59.1)	9 (40.9)
infertility (n=43)	1 (2.3)	42 (94.7)	16 (37.2)	27 (62.8)
colpitis (n=148)	6 (4.1)	142 (95.9)	53 (35.8)	95 (64.2)
cervicitis with erosion or without (n=80)	3 (3.8)	77 (96.2)	23 (28.7)	57 (71.3)
unsuccessful pregnancy (n=70)	2 (2.9)	68 (97.1)	19 (27.1)	51 (72.9)
pelvic inflammatory disease (n=75)	4 (5.3)	71 (94.7)	18 (24.0)	57 (76.0)
urethral syndrom (n=103)	2 (1.9)	101 (98.1)	19 (18.4)	84 (81.6)

Table 2. **Coinfection of *U. urealyticum* with others sexually transmitted pathogens (n=79)**

Pathogen	Coinfection n (%)
U. urealyticum + *C. albicans*	23 (29.1)
U. urealyticum + *C. trachomatis*	11 (13.9)
U. urealyticum + *M. hominis*	8 (10.1)
U. urealyticum	37 (46.8)

Table 3. **Clinical symptoms in women testing positive for *U. urealyticum* only (n=37)**

Symptom	n (%)
vaginal discharge	16 (43.3)
vulval or vaginal irritation	7 (18.9)
lower abdominal pain	4 (10.8)
dysuria	4 (10.8)
contact bleeding	2 (5.4)
dyspareunia	1 (2.7)
asymptomatic course	3 (8.1)

without erosion – 80, urethral syndrome – 103, pelvic inflammatory disease (PID) – 75, gestational pathology (miscarriage, preterm labour) – 70, and fertility impairment – 43. In 22 women, tests were done for epidemiological reasons (casual sexual relationship, patients of STD clinic).

Material for analysis included smears taken from the uterine cervix and/or urethra, and from vaginal fornix posterior. A Mycoplasma IST 2 kit was used for biochemical determination of mycoplasmal infections (BioMerieux). This test allows identification of mycoplasmal pathogens within 48 h and estimation of the amount of bacteria to differentiate between colonization and infection ($>10^4$ cells – evidence of infection). It also makes it possible to evaluate antibiotic sensitivity of the microorganisms. In 248 women, a direct immunofluorescence method with monoclonal sera (Trinity Biotech) was used for the diagnosis of *Chlamydia trachomatis* (*C. trachomatis*) infection and standard culture methods (Biomed) were applied to detect *Trichomonas vaginalis* (*T. vaginalis*) and *Candida Albicans* (*C. albicans*). Bacterial vaginosis (BV) was diagnosed according to Amsel's criteria and after macroscopic evaluation of the Gram-stained smears. *Neisseria gonorrhoeae* infection was detected through a microscopic evaluation of Gram-stained smears. The study was approved by the Bioethics Committee, Medical University of Białystok.

Results

In the study group of 541 women, *U. urealyticum* was detected in 161 (29.8%), while *M. hominis* in 20 (3.7%) cases. In all the patients, *Neisseria gonorrhoeae* infection and bacterial vaginosis were excluded. The incidence rates of sexual mycoplasms in the respective groups have been presented in *Tab. 1*. The highest percentage of mycoplasm-positive cultures was found in patients of STD clinic. *U. urealyticum* was detected in 13/22 (59.1%), while *M. hominis* in 2/22 (9.1%) patients. The second highest incidence was observed in patients with fertility impairment. *U. urealyticum* was found in 16/43 women (37.2%) and *M. hominis* in 1/43 (2.3%) patient. The third were the patients with colpitis symptoms. *U. urealyticum* was isolated in 53/148 (35.8%) and *M. hominis* in 6/148 (4.1%) cases. The lowest incidence of both *U. urealyticum* and *M. hominis* was observed in the group of women with the urethral syndrome, being 19/103 (18.4%) and 2/103 (1.9%), respectively.

Of 248 women who underwent complex microbiological diagnostic procedures, 79 (31.9%) had *U. urealyticum* and 8 (3.2%) *M. hominis* infection. The coexistence of *U. urealyticum* infection with other sexually transmitted pathogens has been presented in *Tab. 2*. *U. urealyticum* infection showed most frequent coexistence with *Candida albicans* (29.1%), and less frequent with *C. trachomatis* (13.9%) and *M. hominis* infection (10.1%). *U. urealyticum* infection alone was observed in 37/79 (46.8%), and 1/8 (12.5%) patient had only *M. hominis* infection.

Tab. 3 presents the prevalence of clinical symptoms in women with only *U. urealyticum* infection. The most common symptoms were: vaginal discharge (43.3% of cases), burning and ichting of external sexual organs (18.9%), dysuria (10.8%) and hypogastric pain (10.8%). Other clinical symptoms were not so frequent. In 8.1% of the women, the course of *U. urealyticum* infection was asymptomatic. The detection frequency of *M. hominis* and *U. urealyticum* according to age is shown in *Tab. 4*. The infection was most common in women in the age range 26--30 years (29.2% for U. urealyticum and 50.0% for *M. hominis*). In women aged 31-39 years, the infection was found in 24.8% and 20%, 21-25 years in 21.1% and 25.0%, 40-49 years in 19.9%

Table 4. **Detection of *M. hominis* and *U. urealyticum* in the different age groups**

Age group (years)	*M. hominis* n (%)	*U. urealyticum* n (%)
18-20	0 (0.0)	2 (1.3)
21-25	5 (25.0)	34 (21.1)
26-30	10 (50.0)	47 (29.2)
31-39	4 (20.0)	40 (24.8)
40-49	1 (5.0)	32 (19.9)
50-59	0 (0.0)	6 (3.7)
Total	20 (100)	161(100)

and 5.0% of cases, respectively for *U. urealyticum* and *M. hominis*. In the extreme age groups 18-20 and 50-59, *M. hominis* was not detected, while *U. urealyticum* was present in 1.3% and 3.7% of the cases, respectively.

Discussion

Of the 541 study women, 161 (29.8%) had *U. urealyticum* and 20 (3.7%) *M. hominis* infection. There was a distinct disproportion in the incidence of these two mycoplasm species. *U. urealyticum* was detected in a decisive majority of infections.

Our results are very similar to those obtained by Elias et al., who in the group of 222 women in a similar age range found *U. urealyticum* in 31.8% and *M. hominis* in only 3% of the cases [5]. Schlicht et al. found a higher prevalence of *U. urealyticum*, as compared to our study, in 54% of students with abnormal urogenital findings and ureaplasmas recovered [6]. A substantially higher percentage of detected *U. urealyticum* infections than in our study may be associated with age and sexual activity of the selected group of young women. Low detection rate of *M. hominis* may be due to the fact that there were no women with bacterial vaginosis in our study group. Paavonen et al. and Shafer et al. have revealed that this pathogen is detected significantly more often in women with bacterial vaginosis than in those without BV [7,8]. The association of *M. hominis* with bacterial vaginosis has been confirmed by Keane et al., who revealed genital carriage of this microorganism in 53% of women with BV and in none without BV [9].

We found the highest percentage of positive cultures in patients of STD clinic – 59.1% and 9.1% for *U. urealyticum* and *M. hominis*, respectively. This is consistent with literature data, which indicate a high prevalence of these pathogens in the women reporting sexual risk behaviour [1,10]. Koch et al. showed that of all genital pathogens, *U. urealyticum* was cultured in the vaginal fluid of the STD patients most frequently [11].

Among infertility patients, *U. urealyticum* in cervical swabs was detected in as many as 37.2% of cases, while *M. hominis* only in 2.3%. In a study by Stray-Pedersen et al., in the cervical samples *U. urealyticum* was present in about 50% of infertile women and positive cultures from the endometrium were obtained in 26% of these women [12].

In Poland, the relationship between the incidence of mycoplasmal infections and fertility impairment in women was investigated by Elias et al. [5]. In a group of 30 infertile women they isolated *U. urealyticum* in the cervical swabs from 33.3% of the patients, while *M. hominis* was not detected at al. In the study by Rodrigueaz et al., the presence of *U. urealyticum* was related to infertility. These authors found ureaplasmal infections in 23.5% and *M. hominis* in 4.8% of the examined women [13].

In our study, the incidence rate of *U. urealyticum* infection was the third highest in patients with the symptoms of colpitis. *U. urealyticum* was detected in 35.8%, while *M. hominis* in 4.1% of the examined. Yavuzdemir et al. found similar incidence rates of *U. urealyticum* and *M. hominis* in women with vaginal discharge (33.9% and 11%, respectively) [14]. Also Sahoo et al. obtained similar results, finding *U. urealyticum* in 43% of 93 women with colpitis symptoms and detecting no *M. hominis* [15]. Di Bartolomeo et al. reported considerably higher percentages of both microorganisms (61.4% *U. urealyticum* and 16.5% *M. hominis*) [16].

In patients with cervical inflammation symptoms (with or without erosion), *U. urealyticum* was isolated in 28.7% and *M. hominis* in 3.8% of cases. Bhandari et al. detected the presence of *U. urealyticum* in 56% of chronic cervicitis women and in 38% of the cases this pathogen was the only one [17]. In the study conducted by Pisani et al., *U. urealyticum* and *M. hominis* were the most common microorganisms in women with abnormal colposcopic findings [18].

In patients with adverse pregnancy outcome, *U. urealyticum* was detected in 27.1% of cases, while *M. hominis* in 2.9%. Ye et al. found higher percentages of both species in women with spontaneous abortion due to early embryonic death. In these cases, *U. urealyticum* was found in as many as 74.1% and *M. hominis* in 27.6% [19]. Unzeitig et al. in cervical-vaginal swabs isolated *U. urealyticum* in 59% and *M. hominis* in 18% of women with spontaneous abortion [20]. Donders et al., Horowitz et al., Mahler et al. and Abele-Horn et al. observed an increased risk of miscarriage associated with genital mycoplasmal infection [21-24].

According to some authors, *M. hominis* is a major pathogen in pelvic inflammatory diseases, being detected in 10-40% of cases [25-28]. In our study, the percentage of *U. urealyticum* was considerably higher (24%) and it was in agreement with the data reported by Elias et al. who in PID patients found *U. urealyticum* in 35.5% and *M. hominis* in 3.2% of cases [5]. The results of studies conducted by Abele-Horn et al. and Miettinen in patients suffering from PID, also indicate the role of *U. urealyticum* in this clinical syndrome [24, 28].

In patients with the urethral syndrome, *U. urealyticum* was detected in 18.4%, while *M. hominis* in 1.9% of the cases. Avites and Zaragaza provided similar data [29]. Potts et al. in women with chronic urinary symptoms detected *U. urealyticum* in 45.8% and *M. hominis* in 2.1% [30]. According to Schlicht et al., in young women with abnormal urogenital symptoms *U. urealyticum* was twice as frequent as *M. hominis* [6]. Literature data and our own study results seem to confirm a significant role of *U. urealyticum* in the inflammatory states of the urinary system in women.

In our study, *U. urealyticum* infection coexisted most frequently with *C. albicans* infection (29.1%), less with *C. trachomatis* (13.9%) and *M. hominis* (10.1%). There were no women with *Neisseria gonorrheae* (*N. gonorrheae*) infection in

the study group. Belkum et al. observed a similar coexistence of sexually-transmitted infections [10]. Chinese researchers Liu et al., however, obtained different results [31]. In their study, 119 women with urogenital infection symptoms underwent complex microbiological diagnostic procedures, and 27.7% of the cases were *U. urealyticum* positive. The authors found an incidence of coinfection with other pathogens, such as *N. gonorrhoeae* 14.5%, *C. albicans* 13.5%, *M. hominis* 8.7%.

Among the most commonly reported complaints in *U. urealyticum* infected women there were: vaginal discharge – 43.3%, vulval or vaginal irritation – 18.9%, dysuria – 10.8% and lower abdominal pain – 10.8% of cases. Other ailments were much less frequent. In 8.1% of the patients the course of *U. urealyticum* infection was asymptomatic. The symptoms found to accompany *U. urealyticum* infection usually occur in genital infections of other aetiologies.

The incidence of *U. urealyticum* and *M. hominis* infections was also analysed in relation to age. The rate was higher in the age range of 26-30 years (29.2% for *U. urealyticum* and 50.0% for *M. hominis*). The results are consistent with literature data [32,33].

Conclusions

1. In the study group of women, the incidence rate of genitourinary infections due to *U. urealyticum* was considerably higher as compared to *M. hominis* infection.
2. Sexual mycoplasmal infections were most frequently reported in the group of patients of STD clinic.
3. *U. urealyticum* infection of the genitourinary system in women are usually clinically symptomatic.
4. The incidence of *U. urealyticum* and *M. hominis* infections of the female genitourinary system is distinctly correlated with age and sexual activity.
5. The diagnosis of the inflammatory states of the genitourinary system and their complications should involve tests for these pathogens, especially for *U. urealyticum*.

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