



Prevalence of *Trichomoniasis* and *Vulvovaginal Candidiasis* among Married Women in Duhok City, Kurdistan Region, Iraq

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ABSTRACT

Trichomonas vaginalis and *Candida* spp. are the most common causes of vaginal infections among reproductive-age women. *T. vaginalis* is a sexual protozoa parasite that causes trichomoniasis. *Candida* spp. are fungal and cause infection in the female genital tract named candidiasis. Both microorganisms if not treated correctly may lead to various complications, such as abortion, premature delivery, disorders of menstrual cycle, and infertility. The current study aimed to study the frequency of infections with *T. vaginalis* and *Candida* spp., including *C. albicans*, *C. krusei*, and *C. glabrata*, among females with vaginal infection in Duhok City, Kurdistan region, Iraq. A total of 400 vaginal swabs were collected from women with vaginal infections that attended the Vin Private Laboratory (n=250) and Arveen Private Laboratory (n=150). Out of these 400 vaginal swabs samples, 24 samples were recorded positive for *T. vaginalis* by direct smear and 100 samples for candidiasis by culturing on the CHROMagar™ Candida. Three species of *Candida* were isolated, namely *C. albicans*, *C. krusei*, and *C. glabrata*, and their prevalence rates were obtained at 60.9%, 28.25, 7.3%, and 3.6%, respectively. Vaginal infection was commonly found in the age group of 25-35 years (49.6%), followed by the age group of 35-45 years (36.4%). Moreover, 3.2% of samples were found to have a mixed infection with trichomoniasis and candidiasis. Because these two causative agents cause numerous complications in women, it is highly recommended proper controlling measures, such as health education, personal hygiene, and treatment of infected women, be implemented to prevent or decrease vaginal infection.

Keywords: *Candida* spp, Reproductive-age women, *Trichomonas vaginalis*, Vaginal infection

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1. Introduction

Vaginal infections are frequent among women of reproductive age (1). They can result from disorders that cause the overgrowth of endogenous microbiota or from sexually transmitted microorganisms. *Candida albicans* and *Trichomonas vaginalis* are two of the more prevalent vaginal microorganisms (2, 3). *T. vaginalis* is a facultative urogenital flagellate protozoan parasite of humans transmitted sexually and causing a disease named trichomoniasis or trich (4, 5). *T. vaginalis* is the most prevalent pathogenic protozoan of women in industrialized countries and is responsible for over half of all sexually transmitted infections (2, 6). Women with trichomoniasis frequently have vaginal pH levels above 4.5. However, more than 50% of those with the infection show no symptoms (7). The main symptoms of trich in women with *T. vaginalis* infection are the experience of moderate to severe cervicitis, vulvovaginitis, urethritis, premature birth or low birth weight, cervical cancer, or more susceptibility to HIV (8, 9). *Candida*-related fungi are commensals and frequently found in colonizing human skin, the gastrointestinal tract, and the genitourinary system (10). *Candida* spp. is the second most common cause of vulvovaginitis, after bacterial vaginosis (1, 11). Three out of every four women will experience at least one incident of vulvovaginal candidiasis (VVC) in their lifetimes, and it is approximated that one out of five women has *Candida* spp. and other types of fungi in their vagina (12, 13). Vulvovaginal candidiasis is known as a condition when there are symptoms of genital irritation or inflammation as well as the presence of *Candida* spp. without the presence of other etiologies (10). Therefore, the existence of this fungus does not imply an infection. Vulvovaginal candidiasis typically causes burning, itching, and vaginal discharge that resembles curd and pruritus. *Candida* proliferates better in environments with pH levels between 3.9 and 5.0 (14, 15). Vaginal pH is typically less than 4.5 in cases of VVC (1). This study aimed to compare the prevalence of *T. vaginalis* and *Candida* spp. to confirm the coexistence of these two agents.

2. Materials and Methods

2.1 Sample Collection and Processing:

This study was conducted in Duhok City, Iraq, between August 2022 and May 2023. A total of 400 vaginal swabs were collected from married women with vaginal infections that attended the Vin Private Laboratory (n=250) and Arveen Private Laboratory (n=150), Duhok City, Iraq. Initially, the direct wet smear was prepared for all vaginal swabs and examined under the microscope for screening of *T. vaginalis*. Following that, all vaginal swabs were cultured first on the blood agar and then sub-cultured on the CHROMagar™ *Candida* for the detection of *Candida* species.

2.2 Statistical analysis

The collected data were analyzed in SPSS software (version 15.0).

3. Results

Of the 400 vaginal swabs tested, 24 (6.0%) were positive for trich, and 110 (27.5%) were positive for candidiasis in married women that attended both Vin and Arveen private laboratories. Table 1

presents the total vaginal swabs collected from women of different ages who attended the Vin and Arveen privates laboratories. Table 2 shows the prevalence of infection of both trichomoniasis and candidiasis. Based on table 2, the infection rate of these diseases dropped with increasing age as follow: infection rate with both diseases were respectively 3.5%, and 18.25% in women in the age group of 25-34, 1.75% and 6.5% in the age group of 35-44, and 0.75% and 2.75% in age groups of 45-55 years old. These results were not significant at $P < 0.05$. It is shown in table 3 that depending on the wet vaginal swabs and culturing, 24 of 400 vaginal swaps (6.0%) were reported positive for trichomoniasis, 100 vaginal swaps (27.0%) were positive for candidiasis, and 8 vaginal samples (2.5%) were having a mixed infection (trich and candidiasis). During the current study, three species of candida, namely *C. albicans*, *C. krusei*, *C. glabrata*, were isolated from vaginal swabs by culturing on CHROMagar™ *Candida*, with a prevalence rate of 60.9%, 7.3%, and 3.6% respectively, as shown in table 4. These results were significant at $P < 0.05$.

4. Discussion

The low prevalence of trichomoniasis in this study was similar to the results found in some cities of Iraq. In Erbil City, this rate was (1.66 %) (16) and in Al-Najaf City was (8.05%) (17). These prevalence rates were lower compared to those reported in other countries, such as Polska (62-78%) (18), New York (25%) (19), and South Korea (10.4%) (20). The lower rate of trichomoniasis in this study is attributed to Islam forbidding non-marital relationships in its laws and customs. When compared to more liberal non-Islamic nations, this may be explained by the lower prevalence of this sexually transmitted protozoan infection in Islamic nations. According to reports (21, 22), sexually active women have a greater infection rate, and having multiple partners as well as lifestyle contribute to an increase in transmission.

Table 1: Total vaginal swabs were collected from women according to the age that attended the Vin and Arveen Privates Laboratories

Age group	Total vaginal swaps were examined	Percentage %
25-35	204	51.0
35-45	141	35.25
45-55	55	13.75
Total	400	100

The chi-square statistic is 0.005. The p -value is .997481. The result is not significant at $p < 0.05$

Table 2: The prevalence of Trich and Candidiasis according to the age groups

Age group	Total vaginal swabs	Positive for <i>T. vaginalis</i>	Positive for <i>Candida spp.</i>
25-34	204	14 (3.5%)	73 (18.25%)
35-44	141	7 (1.75%)	26(6.5%)
45-55	55	3(0.75%)	11(2.75)
Total	400	24(6.0%)	110 (27.5)

The chi-square statistic is 8.4086. The *p*-value is .077708. The result is *not* significant at *p* < 0.05

Table 3: Types of infection were identified from vaginal swabs

Type of Infection	No. of Positive	Percentage (%)
Trichomoniasis	24	6.0
Candidiasis	110	27.0
Mixed Infection (Trich with Candidiasis)	8	2.0

The chi-square statistic is 0.0017. The *p*-value is .999168. The result is *not* significant at *p* < 0.05.

Table 4: Species and percentage of *Candida* were identified in the present study

<i>Candida</i> species	Positive cases
<i>C. albicans</i>	67(60.9%)
<i>C. krusei</i>	8(7.3%)
<i>C. glabrata</i>	4(3.6%)
Total	110

The chi-square statistic is 67.8744. The *p*-value is < 0.00001. The result is significant at *p* < 0.05

In the current study, the prevalence rate of trichomoniasis and candidiasis decreased with increasing age. Accordingly, infection rates with both diseases were higher in women in the age group of 25-34 years old, followed by age groups of 35-44 and 45-55 years old. These results were not significant at *P* < 0.05. These findings were in agreement with those of a study conducted in Baghdad City, Iraq, by Al-Muathenand and Sachit (2016) (23) among non-pregnant and pregnant women. They recorded the highest prevalence rate of both diseases in younger age groups. Furthermore, the decline in the prevalence rate of this disease with aging in the present study was consistent with the results of research carried out by Nourian et al. in Zanjan, Iran, among pregnant women (24). These results may be due to a rise in hormonal and immunologic changes, which together can heighten the susceptibility of vaginal tissue to these infections (25). Additionally, this increase might be partially caused by a low vaginal pH, which is ideal for fungus growth (26, 27). In the current study, although trichomoniasis and candidiasis were more prevalent in the age group of 25-34 years old, there was a modest rise in the number of elderly women who were infected compared to women who were under 40 years old. This finding was in agreement with the results of a study performed by Ali (2012) (24) on menopausal women; however, they were not significant at *P* > 0.05. The increase among younger women may be attributed to the higher sexual activity rates in this age group (28). These results were inconsistent with our results demonstrating that the most common species of *Candida* that caused vulvovaginitis in women was *C. albicans* (60.9%), ranking first, followed by *C. krusei* (7.3%) and *C. glabrata* (3.6%). Recently, in Al-Diwaniyah City, Iraq, Al-Sudani and Al-Awsi (2022) recorded the prevalence rates of species *C. albicans* (47.46%), *C. glabrata* (27.12%), *C. tropicalis* (15.25%), and *C. krusei* (10.17%) among women (28- 29-30); these results were

relatively similar to the current study results. Finally, mixed infections (*T. vaginalis* and *Candida*) were reported among women. It can be concluded that the age group of 25-35 years old is more susceptible to trichomoniasis and candidiasis than the other age groups. It was also found that the most frequent species of *Candida* were *C. albicans*, *C. krusei*, and *C. glabrata*, with *C. albicans* as the most common cause of vulvovaginal candidiasis.

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Authors' Contribution

Study concept and design: Shameeran Salman
 Acquisition of data: Shameeran Salman
 Analysis and interpretation of data: Shameeran Salman
 Drafting of the manuscript: Shameeran Salman
 Critical revision of the manuscript for important intellectual content: Shameeran Salman
 Statistical analysis: : Shameeran Salman
 Administrative, technical, and material support: Shameeran Salman

Ethics

The author declare all ethical standards have been respected in preparation of the submitted article.

Conflict of Interest

The author declares that there is no conflict of interest.

References

1. Frobenius W, Bogdan C. Diagnostic Value of Vaginal Discharge, Wet Mount and Vaginal pH - An Update on the Basics of Gynecologic Infectiology. *Geburtshilfe und Frauenheilkunde*. 2015;75(4):355–366. DOI: 10.1055/s-0035-1545909
2. Angebault C, Djossou F, Abélanet S, Permal E, Ben Soltana M, Diancourt L, et al. *Candida albicans* is not always the preferential yeast colonizing

- humans: a study in Wayampi Amerindians. *The Journal of infectious diseases*. 2013; 208(10): 1705–1716. DOI: 10.1093/infdis/jit389
3. Workowski KA, Bolan GA. Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines. MMWR. Recommendations and reports: Morbidity and mortality weekly report. Recommendations and reports. 2015;64(RR-03): 1–137.
 4. Poole DN, McClelland RS. Global epidemiology of *Trichomonas vaginalis*. *Sexually transmitted infections*. 2013; 89(6): 418–422. DOI: 10.1136/sextrans-2013-051075
 5. Kissinger P. *Trichomonas vaginalis*: a review of epidemiologic, clinical and treatment issues. *BMC infectious diseases*. 2015;15:307. DOI: 10.1186/s12879-015-1055-0
 6. Manshoori A, Mirzaei S, Valadkhani Z, Kazemi Arababadi M, Rezaeian M, Zainodini N, et al. A Diagnostic and Symptomatology Study on Trichomoniasis in Symptomatic Pregnant Women in Rafsanjan, South Central Iran in 2012-13. *Iranian journal of parasitology*. 2015; 10(3): 490–497.
 7. Sutton M, Sternberg M, Koumans EH, McQuillan G, Berman S, Markowitz L. The prevalence of *Trichomonas vaginalis* infection among reproductive-age women in the United States, 2001–2004. *Clinical infectious diseases: an official publication of the Infectious Diseases Society of America*. 2007; 45(10):1319–1326. DOI: 10.1086/522532
 8. Hobbs MM, Lapple DM, Lawing LF, et al. Methods for detection of *Trichomonas vaginalis* in the male partners of infected women: implications for control of trichomoniasis. *Journal of clinical microbiology*. 2006; 44(11):3994–3999. DOI: 10.1128/JCM.00952-06
 9. Kazemi F, Hooshyar H, Zareikar B, Bandehpour M, Arbabi M, Talari S, et al. Study on ITS1 Gene of Iranian *Trichomonas vaginalis* by Molecular Methods. *Iranian Journal of Parasitology*. 2010; 5(4): 9–14.
 10. Achkar JM, Fries BC. Candida infections of the genitourinary tract. *Clinical microbiology reviews*. 2010; 23(2): 253–273. DOI: 10.1128/CMR.00076-09
 11. Sobel JD. *Sexually Transmitted Infections and Sexually Transmitted Diseases*. Berlin, Heidelberg: Springer Berlin Heidelberg. Genital Candidiasis. 2011. pp. 613–24.
 12. De Bernardis F, Arancia S, Sandini S, Graziani S, Norelli S. Studies of Immune Responses in Candida vaginitis. *Pathogens*. 2015;4(4):697-707.
 13. Sobel JD. Recurrent vulvovaginal candidiasis. *American journal of obstetrics and gynecology*. 2016; 214(1):15–21. DOI: 10.1016/j.ajog.2015.06.067
 14. Rodrigues MT, Gonçalves AC, Alvim MC, Castellano Filho DS, Zimmermann JB, da Silva VL, Diniz CG. Associação entre cultura de secreção vaginal, características sociodemográficas e manifestações clínicas de pacientes com diagnóstico de candidíase vulvovaginal [Association between vaginal secretion culture, socio-demographic characteristics and clinical manifestations of patients with vulvovaginal candidiasis]. *Revista brasileira de ginecologia e obstetrícia: revista da Federação Brasileira das Sociedades de Ginecologia e Obstetrícia*. 2013; 35(12): 554–561. DOI: 10.1590/s0100-72032013001200005
 15. Du H, Huang G. Environmental pH adaption and morphological transitions in *Candida albicans*. *Current genetics*. 2016; 62(2): 283–286. DOI: 10.1007/s00294-015-0540-8
 16. Kadir MA, Fattah COD. *Trichomonas vaginalis* among women in Sulaimania Governorate-Iraq, Tikrit. *Journal of Pharmaceutical Science*. 2010; 6:1-9
 17. Naama J, Hasson F, Abdullah E. Detection of *Trichomonas vaginalis* among women with contraceptive usage in Al-Najaf Alashraf City. *The-Qar Medical Journal*. 2008; 2:46- 50.
 18. Kumatowska A, Mamos AR. Prevalence of *Trichomonas vaginalis* Donné in women of Lódz population in 1955-1999 years. *Was Parasitology*. 2001; 47(1): 9-12.
 19. Schwebke J, Burgess D. Trichomoniasis, *Clinical Microbiology Reviews*. 2004; 17(4):794–803.
 20. Ryu JS, Min DY. *Trichomonas vaginalis* and trichomoniasis in the Republic of Korea. *Korean Journal of Parasitology*. 2006; 44(2) 101- 116
 21. Bowden FJ, Garnett GP. *Trichomonas vaginalis* epidemiology: parameter rising and analyzing a model of treatment intervention. *Sexually Transmitted Infection*. 2000; 76:248-256.
 22. Verteramo R, Calzolari E, Degener AM, Masciangelo R, Patella A. *Trichomonas vaginalis* infection: risk indicators among women attending for routine gynecologic examination. *Journal of Obstetrics and Gynaecology Research*. 2008; 34:233-237.
 23. Nourian A, Shbani N, Fazaeli A, Mousavinasab SN. Prevalence of *Trichomonas vaginalis* in Pregnant Women in Zanjan, Northwest of Iran. *Jundishapur Journal of Microbiology*. 2013; 6(8):e77258
 24. Ali SF. Incidence of *Trichomonas vaginalis* infection after menopause age of women. *Al-Taqani*. 2012; 25(2):16-20
 25. Dolgushina VF, Telesheva LF, Dolgushina II. The local immunity of genital system in pregnant women with a genital infection. *Zhurnal mikrobiologii, epidemiologii i immunobiologii*. 2000; 2: 92-5
 26. Gentry LO, Price MF. Urinary and genital candida infections. In: *Candidiasis*. Body GP, Fainstein V. Raven press. 1985;166-69
 27. Fetouh, M., Elbarbary, H., Ibrahim, E., Maarouf, A. Effect of Adding Lactoferrin on Some Foodborne Pathogens in Yogurt. *Iranian Journal of Veterinary Medicine*, 2023; 17(3): 189-198. doi: 10.32598/ijvm.17.3.1005313
 28. AL-Muathenand DM, Sachit HG. Prevalence Trichomoniasis and Candidiasis For Symptomatic Pregnant and Non Pregnant Women in Iraq. *Al-Mustansiriyah Journal of Pharmaceutical Sciences*. 2016; 16(2): 21-26
 29. Alsudani AA, Al-Awsi GRL. Detection of Candida Spp. that cause vulvovaginitis in women that use contraceptive methods. *Wiadomosci lekarskie (Warsaw, Poland: 1960)*, 2022; 75(8pt2):1965-1969. doi:10.36740/WLek202208204
 30. Hosseinabadi, E., Talebkhan Garoussi, M., Khosravi, A. R., Gharaghozloo, F., Khorramian Toosi, B., Moosakhani, F. Prevalence of Prototheca and Fungal Contamination of Bulk Milk Tank of Industrial Dairy Cattle Herds in Iran. *Iranian Journal of Veterinary Medicine*, 2022; 16(2): 155-165. doi: 10.22059/ijvm.2021.327607.1005187
 31. Peidai, F., Ahari, H., Anvar, S. A. A., Ataee, M. Nanotechnology in Food Packaging and Storage: A Review. *Iranian Journal of Veterinary Medicine*, 2021; 15(2): 122-153. doi: 10.22059/ijvm.2021.310466.1005130