IJPSR (2025), Volume 16, Issue 4 (Research Article)

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 14 November 2024; received in revised form, 10 December 2024; accepted, 11 December 2024; published 01 April 2025

VULVOVAGINAL CANDIDIASIS AMONG FEMALES OF REPRODUCTIVE AGE AT A TERTIARY CARE CENTER, WESTERN UTTAR PRADESH

R. Kamal [1], D. P. Singh [1], N. Mittal [2] and R. K. Verma [*1]

Department of Microbiology [1], Department of Obstetrics & Gynaecology [2], UPUMS, Saifai - 206130, Uttar Pradesh, India.

Keywords:

Broth micro dilution, CHROM agar, SDA agar, Candida

Correspondence to Author:
R. K. Verma

HOD,
Department of Microbiology,
UPUMS, Saifai - 205264, Uttar Pradesh, India.

E-mail: rshverma@gmail.com

ABSTRACT: Background: Vulvovaginitis is an inflammation or infection of vulva and vagina. *Candida* is a commensal micro-organism which mainly colonizes the mucosal surfaces of human body such as gastrointestinal tract, respiratory tract and genitourinary tract. This study aimed to find prevalence of vulvovaginal candidiasis and determine antifungal susceptibility pattern of clinical Candida isolates among samples at U.P.U.M.S, Saifai. **Materials and Methods:** A total of112 vaginal swabs were collected from patients with symptoms suggestive of vulvovaginal candidiasis. Candida species were isolated and identified using standard laboratory techniques. Antifungal susceptibility testing was performed using Broth microdilution method. **Results:** Out of 58 *candida* isolates the most common clinical strains isolated were *Candida albicans*, *Candida glabrata*, *Candida tropicalis*, *Candidakrusei*, *Candida dubliniensis* and *Candida parapsilosis*. *Candida albicans* was the most prevalent species (23.2%). Mean value of MIC for itraconazole against candida species ranges from 0.063-1.00µg/ml, for terbinafine against *Candida* species was found to be 0.031-4.00µg/ml, for voriconazole against candida species was found to be 0.012-27.897µg/ml and for fluconazole it was 0.003-42.50µg/ml. **Conclusion:** This study demonstrates the importance of investigating the prevalence and antifungal susceptibility pattern of VVC. Our findings have implications for treatment strategies and highlight the need for continued monitoring of antifungal susceptibility patterns.

INTRODUCTION: Vulvovaginal candidiasis (VVC) is a common gynaecological disorder affecting millions of women worldwide [1]. The increasing prevalence of VVC, coupled with rising antifungal resistance, poses significant therapeutic challenges [1]. Candida species, particularly *Candida albicans*, are the primary causative agents of VVC. However, the emergence of non-albicans species and antifungal resistance has complicated treatment outcomes [2]. This study aims to bridge this knowledge gap by investigating the prevalence, species distribution, and antifungal resistance patterns of VVC in a tertiary care setting.

Understanding the local epidemiology and antifungal susceptibility patterns is crucial for developing effective treatment strategies and improving patient outcomes [3]. Antifungal susceptibility testing was performed according to the Clinical and Laboratory Standards Institute (CLSI) M27-S4 micro broth dilution method. The present study aimed to determine the prevalence of

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.16(4).1007-13

This article can be accessed online on www.ijpsr.com

DOI link: https://doi.org/10.13040/IJPSR.0975-8232.16(4).1007-13

Candida infection in patients and the *in-vitro* activity of antifungal drugs itraconazole, voriconazole, fluconazole and terbinafine [4].

MATERIALS AND METHOD: This prospective cross-sectional study was conducted in the Mycology Laboratory, Department of Microbiology, Uttar Pradesh University of Medical Sciences (UPUMS), Saifai, Etawah, Uttar Pradesh (India) from January 2023 to July 2024.

The Institutional Ethics Committee approved the study (Clearance code: 66/2022-23). A total of 112 high vaginal swabs were collected with symptoms like white curdy discharge, itching, vulvar edema, abdominal pain, foul smelling *etc*, were included in this study.

Isolation: During the visit, the women were examined in lithotomy position, a clean bi-valve speculum was inserted into vagina. Once vagina is inspected properly, two high vaginal swab clinical samples (vaginal discharge) were collected. After immediate transportation, the swabs were processed in the microbiology laboratory. First swab was used for preparing wet mount and Gram staining, for fungal identification. The other swab was used for fungal culture. The specimen was inoculated onto Sabouraud's dextrose agar (SDA) supplemented with antibacterial antibiotics then aerobically incubated at 37°C for 24-48 h and well isolated colonies were used to plate on Hi-Chrom agar. The LPCB mount was prepared from the colonies to examine yeast cells and pseudo hyphae.

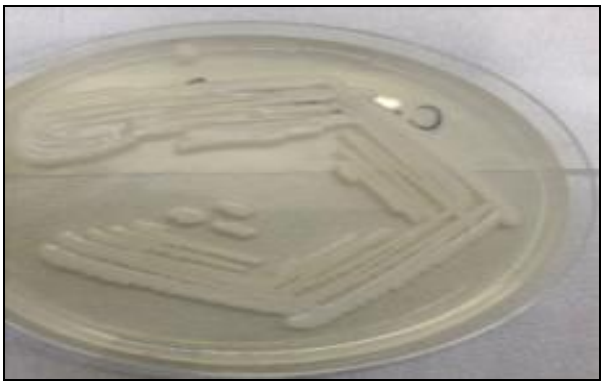

FIG. 1: APPEARANCE OF CANDIDA COLONIES ON SDA AGAR

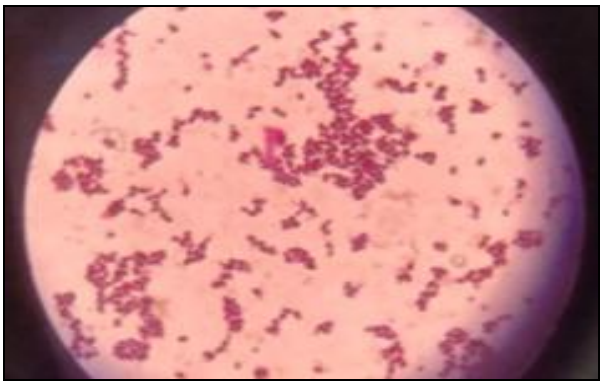

FIG. 2: GRAM´S STAINING SHOWING BUDDING YEAST CELLS AT 100X (OIL IMMERSION)

Identification: Any visible growth seen on the SDA slope was processed for identification of the species. From an isolated colony, macroscopic examination, Gram staining, germ tube test, and chlamydospores formation. The yeast like, pasty, and creamy colonies that showed Gram-positive budding yeast cells with pseudohyphae on microscopic examination and negative urea hydrolysis test were further processed for Candida speciation on CHROM agar. When the growth of yeast colonies was observed, the Gram stain method was used to verify the absence of bacterial contamination. The yeasts were identified via carbohydrate assimilation test and by using the Vitek 2 System (BioMerieux I'Etoile, France) according to the manufacturer's instructions.

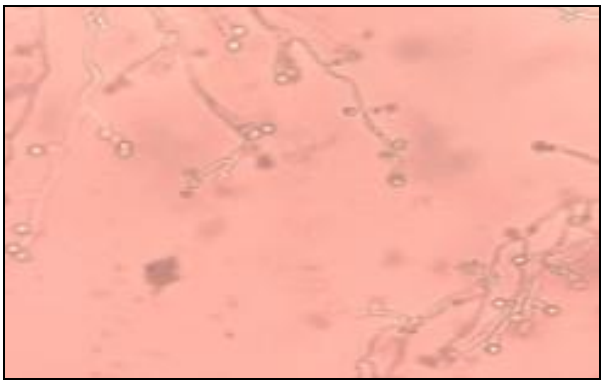

FIG. 3: HICROME CANDIDA DIFFERENTIAL AGAR SHOWING DIFFERENT SPECIES OF CANDIDA

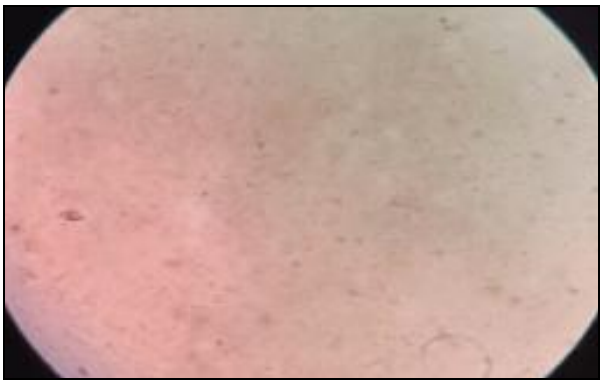

FIG. 4: PSEUDOHYPHAE ON KOH MOUNT

Antifungal Susceptibility Testing: *In-vitro*, antifungal susceptibility testing was performed, and minimum inhibitory concentration (MICs) was determined according to the recommendations stated in the Clinical and Laboratory Standards Institute M27-S4 documents. Voriconazole, terbinafine, fluconazole and itraconazole were used for preparation of the CLSI microdilution trays. The antifungal agents were diluted in the standard RPMI-1640 medium (Sigma Chemical Co.) buffered to pH 7.0 with 0.165 M morpholine propanesulfonic acid (MOPS) (Sigma) with L-glutamine without bicarbonate to yield two times concentrations and dispensed into 96-well microdilution trays at a final concentration range of 0.472-2.134µg/ml for itraconazole, voriconazole, fluconazole and terbinafine. MIC values were determined visually after 24 h-72 h at 35°C [5].

FIG. 5: SHOWS THE RESULT OF MICROBROTH DILUTION

RESULTS: A total of 112 vaginal samples were tested. Majority of cases fall in age group of 26-30 year i.e 33% cases. Majority of females belongs to rural population i.e. 87 cases (77.7%) due to lack of awareness, poor education and low socio-economic status. The most common chief complaint was white curdy discharge in 63 cases (56.35%), followed by itching edema and abdominal pain.

The common isolated species was *Candida albicans* (26spp) which was confirmed by germ tube test (manual test) and Vitek 2 compact system and other non albicans candida species isolated were *Candida glabrata* (11), *Candida tropicalis* (7), *Candida krusei* (6), *Candida dubliniensis* (3) and *Candida parapsilosis* (2).

For cumulative result, for fluconazole, the mean MIC is 2.134 µg/mL with a standard deviation of 5.144 µg/mL; for itraconazole, the mean MIC is 0.438 µg/mL with a standard deviation of 0.617 µg/mL; for voriconazole, the mean MIC is 0.261 µg/mL with a standard deviation of 0.376 µg/mL; and for terbinafine, the mean MIC is 0.472 µg/mL with a standard deviation of 0.839 µg/mL, though the MIC for terbinafine is based on my observation as there is no defined MIC for this antifungal.

TABLE 1: GRAM´S STAINING FINDING

Gram´s stain finding	Frequency (N=112)	Percentage (%)
Budding yeast-like cells	58	51.8
No budding yeast-like cell	54	48.2
Total	112	100.0

TABLE 2: ISOLATED CANDIDA SPECIES

Isolated candida species	Frequency (N=58)	Percentage (%)
Candida albicans	26	23.2
Candida dubliniensis	5	4.5
Candida glabrata	11	9.8
Candida krusei	6	5.4
Candida parapsilosis	3	2.7
Candida tropicalis	7	6.3
Total	58	51.9

TABLE 3: COMPARATIVE ANALYSIS ON MIC VALUES OF ANTIFUNGAL AGENTS AMONG DIFFERENT *CANDIDA* SPECIES

		N	Mean	Std. Deviation	Minimum	Maximum	F-value	p-value
ITR	*Candida albicans*	26	0.524	0.545	0.063	2.000	0.622	0.003*
	Candida dubliniensis	4	0.406	0.400	0.125	1.000		
	Candida glabrata	12	0.540	0.630	0.062	2.000		

	Candida krusei	6	0.573	0.472	0.063	1.000		
	Candida parapsilosis	3	0.708	0.505	0.125	1.000		
	Candida tropicalis	7	0.920	0.833	0.063	2.000		
	Total	58	0.582	0.578	0.062	2.000		
TER	*Candida albicans*	26	0.613	1.121	0.031	4.000	0.415	0.837**
	Candida dubliniensis	5	0.350	0.205	0.125	0.500		
	Candida glabrata	11	0.312	0.363	0.031	1.000		
	Candida krusei	6	0.219	0.222	0.031	0.500		
	Candida parapsilosis	3	0.750	1.083	0.125	2.000		
	Candida tropicalis	7	0.388	0.714	0.031	2.000		
	Total	58	0.472	0.839	0.031	4.000		
VORI	*Candida albicans*	26	0.052	0.035	0.012	0.110	62.435	0.000*
	Candida dubliniensis	5	0.223	0.097	0.125	0.325		
	Candida glabrata	11	16.775	6.429	2.678	27.897		
	Candida krusei	6	0.161	0.124	0.025	0.313		
	Candida parapsilosis	3	0.080	0.019	0.063	0.100		
	Candida tropicalis	7	0.069	0.035	0.025	0.110		
	Total	58	3.253	7.128	0.012	27.897		
FLU	*Candida albicans*	26	0.993	0.626	0.212	2.890	79.276	0.000*
	Candida dubliniensis	5	0.090	0.074	0.016	0.212		
	Candida glabrata	11	2.394	1.842	0.003	5.950		
	Candida krusei	6	30.017	10.256	18.250	42.500		
	Candida parapsilosis	3	2.175	1.514	0.625	3.650		
	Candida tropicalis	7	2.208	1.021	1.180	3.650		
	Total	58	4.391	9.371	0.003	42.500		

DISCUSSION: In this study, 112 women suffering from clinical symptoms of vaginitis were enrolled including 34 diabetic women and 78 non-diabetic women. Vaginal candidiasis is considered as common infection in 60-70% of women belonging to reproductive age group, who experienced the problem at least once during their lifetime.

In current study the prevalence of vulvovaginal candidiasis among reproductive age female of 25-40 years was 51.49% as shown in **Table 2**. Many studies have been carried out to analyze the prevalence of VVC in different parts of the world. In a study conducted by Brandolt TM *et al.* in 2017 the prevalence of vulvovaginal candidiasis was 49.3% [6]. In other study done by Ibrahim Hussen , Alqeer Aliyo *et al*.in 2024 the prevalence was found to be 26.8% which was less than the current study [7]. In the study done by Shirin Hasanvand *et al.* in 2017, the prevalence of vulvovaginal candidiasis was found to be 54.9% [8]. In the study done by Kombade, Sarika P; Abhishek, Kumar Sin 2021, the prevalence was found to be 43%. Which was lesser than the current study [9]. The higher prevalence of vulvovaginal candidiasis is due to low socio-economic status and lack of awareness. VVC is one of the common complaints faced by people women of various age groups. In our study, the prevalence of VVC was more in 26-30 years (33%). 112 patients of the study in reproductive age group suffered from clinical symptoms of vaginitis, of which 58 women (51.78%) suffered from VVC. This is in agreement with earlier studies Deepa babin *et al.* in 2013 showed that highest frequency of VVC was found in 26-35 years (49.58%), followed by 18-25 years and least occurrence was among patients who were more than 40 years in their study [10]. Another study by Hasanvand *et al*. in 2017 also reported a higher incidence of VVC in 20-30 years aged women [8].

The present study consists of 87(77.7%) females belonging to rural area and 25 (22.3%) belongs to urban population. Greater number of cases from rural can be due to the following reasons:

1. Lack of awareness (esp. about hygiene)
2. Poor education
3. Low socio-economic status

This correlate with other study done by Sushil kumar *et al.* in 2022 where rural area counts 65.51% of *Candida* cases as compare to urban area (34.48%) [11]. In present the most common chief complaint was curdy white discharge (56.3%) second common was itching and edema in genital area (17%) and followed by pain in abdomen (9.8%), excessive curdy white discharge(9.8%)

burning sensation while passing urine (5.4%), dyspareunia(1.8%).This correlate well with other study done by Lívia Custódio Pereira *et al.* in 2021, the common complaint was white discharge found in (77.5%) population followed by itching in genital area (79.2%) and burning sensation while passing urine (72.3%) [12]. In other study done by Latha Ragunathan *et al* in 2014 the common complaint was discharge (29.4%) followed by pain in abdomen (15.6%) and itching in genital area (13.3%) [13].

The common species isolated in this study was *Candida albicans* (26) which was confirmed by manual tests (germ tube test) and Vitek 2 compact system. The other NAC isolated in this study was *Candida glabrata* (11), *Candida tropicalis* (7), *Candida krusei* (6), *Candida dubliniensis* (3) and *Candida parapsilosis* (2) as shown in **Table 2**. This in concordance with other study done by Nahed Ghaddar *et al.* in 2019 in which the *C. glabrata* was the most frequently isolated species (44.5%) followed by *C. albicans* (43.4%) and *C. krusei* (12.1%) [14]. In the other study done by N. Song, S. Kan *et al*. in 2021 *C. albicans* (84.7%) was the most frequent, followed by *C. glabrata* (8.7%) [15]. In the study done by Adane Bitew *et al.* in 2018 the most common isolated species was *Candida albicans* (58.6%) followed by *Candida krusei* (17.2%), *Candida dubliniensis* (9.2%), *Candida glabrata* (3.4%), *Candida tropicalis* (2.3%) and *Candida parapsilosis* (2.3%) [16].

In this study, the antifungal susceptibility testing for the clinical strains was carried out by microbroth dilution method It was observed that MIC of itraconazole against candida species ranges from 0.063-1.00µg/ml, for terbinafine against *Candida* species was found to be 0.031-4.00µg/ml, for voriconazole against candida species was found to be 0.012-27.897µg/ml and for fluconazole it was 0.003-42.50µg/ml as shown in **Table 3**.

Overall, out of 58 isolates, 36 (62.1%) is sensitive to itraconazole while 22(37.9%) isolates are resistant. MIC of itraconazole for *Candida albicans* (26 isolates) ranges from 0.063-2.000µg/ml, for *Candida glabrata* it was found to be 0.062-2.000µg/ml, for *Candida tropicalis* it was 0.063-2.000µg/ml, for *Candida krusei* it was 0.063-1.000µg/ml, for *Candida dubliniensis* it was 0.125-1.000µg/ml and for *Candida parapsilosis* it was 0.125-1.000µg/ml. Similar studies were observed by Ronaq Zaman *et al.* in 2022in which he observed that Itraconazole was sensitive in 108(68.4%) and resistant in 36 (22.8%) of isolates [17]. In study done by Deepa Babin *et al.* in 2013 observed that *Candida albicans* were resistant to itraconazole (13.95%), *C. tropicalis* isolates were resistant to itraconazole (21.87%), *C. glabrata* isolates showed (40%) resistance to itraconazole, *C. krusei* isolates were (42%) resistant to itraconazole [10].

Sensitivity of voriconazole to isolates is found to be 43(74.1%) while resistant to 15 isolates (25.9%). MIC of itraconazole for *Candida albicans* ranges from 0.012-0.110µg/ml, for *Candida glabrata* it was 2.678-27.897µg/ml, for *Candida tropicalis* it was 0.025-0.110µg/ml, for *Candida krusei* it was 0.025-0.313µg/ml, for *Candida dubliniensis* it was 0.125-0.325µg/ml and for *Candida parapsilosis* it was found to be 0.063-0.100µg/ml. Similar studies were observed by Ronaq Zaman *et al.* in 2022in which he observed that voriconazole was sensitive in 68 (43%), SDD in 5 (3.2%) and resistant in 85 (53.8%) of isolates [17]. In study done by Deepa Babin *et al.* in 2013 observed that *Candida albicans* were resistant to 9.30% voriconazole, *C. tropicalis* isolates were resistant to voriconazole (18.75%), *C. glabrata* isolates showed (28%) resistance to voriconazole, *C. krusei* isolates showed (21%) resistance to voriconazole [10].

For fluconazole 31(53.4%) are sensitive while 27(46.6%) are resistant. *C. krusei* is intrinsically resistant to fluconazole. The MIC for *Candida albicans* ranges from 0.212-2.890µg/ml, for *Candida glabrata* it was 0.003-5.950µg/ml, for *Candida tropicalis* it was 1.180-3.650µg/ml, for *Candida krusei* it was 18.250-42.500µg/ml, for *Candida dubliniensis* it was 0.016-0.212µg/ml, for *Candida parapsilosis* it was 0.625-3.650µg/ml. Similar studies were observed by Ronaq Zaman *et al.* in 2022 in which he observed that Fluconazole was sensitive in 39 (24.7%) and resistant in 114 (72.2%) of isolates [17]. In study done by Deepa Babin *et al.* in 2013 observed the overall susceptibility rate for *C. albicans* were 76%, and resistance were detected in 16.27%, *C. tropicalis* isolates were resistant to fluconazole was 25%, *C. glabrata* isolates showed (48%) resistance to

fluconazole [10]. For terbinafine, overall, MIC ranges from 0.031-4.000µg/ml. MIC of terbinafine for *Candida albicans* ranges from 0.031-4.000µg/ml, for *Candida glabrata* it was 0.031-1.000µg/ml, for *Candida tropicalis* it was 0.031-2.000µg/ml, for *Candida krusei* it was 0.031-0.500µg/ml, for *Candida dubliniensis* it was 0.125-0.500µg/ml and for *Candida parapsilosis* it was 0.125-2.000µg/ml. The MIC observed is according to my observation as sufficient data is not available.

CONCLUSION: The present study conducted at U. P. U. M. S Saifai Etawah concludes that VVC is prevalent in the reproductive age group of 25-40 years women which was 51.49%. Rural women were found to be more vulnerable to infection than urban women, which could be due to their low socio-economic status, lack of awareness, illiteracy, social stigma, poor hygiene or improper treatment. The study found that the most common isolated species was *Candida albicans* which was found to be most susceptible for routine antifungals drugs like fluconazole, voriconazole etc. while the predominant NAC was *Candida glabrata* and *Candida tropicalis* which showed reduced susceptibility to the routine antifungals, because of which identification up to species level and antifungal susceptibility testing (AFST) is crucial.

Azoles like Fluconazole is one of the drug of choice for treating Candida diseases, but due to their use as over the counter drug with clotrimazole and women who practiced antifungal self-medication, antifungal resistance emerging as a threat that is leading to treatment failure and increase in cases of recurrent VVC.

A screening program is of utmost importance and provides a guide to clinicians to prescribe the appropriate dose of anti-fungal drug to patients with signs/symptoms of VVC, which can be beneficial to quite an extent, for the treatment of vulvovaginal candidiasis. Prompt laboratory diagnosis of VVC and AFST is essential to monitor the emerging antifungal resistance.

The estimation of the prevalence of vulvovaginal candidiasis in this area will play a significant role in the control measures against VVC. Additionally, this study offers baseline data on the frequency and pattern of antifungal susceptibility of isolates of *Candida* in our area that will help clinicians to formulate treatment guideline for VVC in this area.

The susceptibility pattern of isolates shows alarming rates of resistance to fluconazole and clotrimazole, emphasizing the need for alternative treatment options and antifungal stewardship. The study's findings have important implications for clinical practice, highlighting the need for:

1. Enhanced diagnostic capabilities for accurate species identification and antifungal susceptibility testing.
2. Rational use of antifungal agents, considering local resistance patterns.
3. Development of effective treatment strategies for *non-albicans Candida* species.
4. Public awareness and education on prevention and management of VVC.

Therefore, all women should be educated about symptoms and personal hygiene to solve the problem of vulvovaginal candidiasis.

This study contributes to the understanding of VVC epidemiology and antifungal resistance patterns in the region, informing evidence-based practices to improve patient outcomes and reduce the burden of this common fungal infection.

ACKNOWLEDGEMENT: I would like to extend my sincere gratitude to my author Dr. D. P. Singh sir, co-author Dr. R. K. Verma sir for their guidance and expertise, Dr. Nupur Mittal ma'am for assisting in sample collection. Thanks to institution U. P. U. M. S. Saifai Etawah for providing resources and facilities. Their contributions have significantly enhanced the quality of this research.

Funding: Non-Funded

CONFLICT OF INTEREST: Nil

REFERENCES:

1. Amini F, Namjooyan F, Zomorodian K, Zareshahrabadi Z, Shojaei K, Jaladat AM and Hashempur MH: The efficacy of complementary treatment with marshmallow (*Althaea officinalis* L.) on vulvovaginal candidiasis: a randomized double-

blinded controlled clinical trial. EXPLORE 2023; 19(6): 813-9.
2. de Cássia Orlandi Sardi J, Silva DR, Anibal PC, de Campos Baldin JJ, Ramalho SR, Rosalen PL, Macedo ML and Hofling JF: Vulvovaginal candidiasis: epidemiology and risk factors, pathogenesis, resistance, and new therapeutic options. Current Fungal Infection Reports 2021; 15: 32-40.
3. Malinovská Z, Čonková E and Váczi P: Biofilm formation in medically important Candida species. Journal of Fungi 2023; 9(10): 955.
4. Cisterna R, Tellería O, Hernaez S and Ezpeleta G: Impact of the new clinical breaking points proposed by the Clinical and Laboratory Standards Institute (CLSI) in the antifungal susceptibility profile of clinical strains isolated from invasive bloodstream Candida spp. Infections in Spain. Clinical Medicine Insights: Therapeutics 2012; 4: 8293.
5. Chander J: Textbook of medical mycology. JP Medical Ltd; 2017; 30.
6. Brandolt TM, Klafke GB, Gonçalves CV, Bitencourt LR, Martinez AM, Mendes JF, Meireles MC and Xavier MO: Prevalence of Candida spp. in cervical-vaginal samples and the *in-vitro* susceptibility of isolates. Brazilian J of Microbio 2017; 48(1): 145-50.
7. Hussen I, Aliyo A, Abbai MK and Dedecha W: Vaginal candidiasis prevalence, associated factors, and antifungal susceptibility patterns among pregnant women attending antenatal care at bule hora university teaching hospital, Southern Ethiopia. BMC Pregnancy and Childbirth 2024; 24(1): 619.
8. Hasanvand S, Qomi HA, Kord M and Didehdar M: Molecular epidemiology and *in-vitro* antifungal susceptibility of candida isolates from women with vulvovaginal candidiasis in northern cities of Khuzestan province, Iran. Jundishapur Journal of Microbiology 2017; 10(8).
9. Kombade SP, Abhishek KS, Mittal P, Sharma C, Singh P and Nag VL: Antifungal profile of vulvovaginal candidiasis in sexually active females from a tertiary care hospital of Western Rajasthan. Journal of Family Medicine and Primary Care 2021; 10(1): 398-402.
10. Babin D, Kotigadde S, Rao PS, Rao TV and Babin MD: Clinico-mycological profile of vaginal candidiasis in a tertiary care hospital in Kerala. Int J Res Biol Sci 2013; 3(1): 55-9.
11. Kumar S, Goyal R and Kumar A: Determination of vulvovaginal candidiasis in Tertiary Care Hospital. Asian J Pharm Clin Res 2022; 15(8): 201-4.
12. Pereira LC, Correia AF, da Silva ZD, de Resende CN, Brandão F, Almeida RM and de Medeiros Nóbrega YK: Vulvovaginal candidiasis and current perspectives: new risk factors and laboratory diagnosis by using MALDI TOF for identifying species in primary infection and recurrence. European Journal of Clinical Microbiology & Infectious Diseases 2021; 40: 1681-93.
13. Kalaiarasan K, Singh R and Chaturvedula L: Fungal profile of vulvovaginal candidiasis in a tertiary care hospital. Journal of clinical and diagnostic research: JCDR 2017; 11(3): 06.
14. Ghaddar N, El Roz A, Ghssein G and Ibrahim JN: Emergence of vulvovaginal candidiasis among Lebanese pregnant women: prevalence, risk factors, and species distribution. Infectious Diseases in Obstetrics and Gynecology 2019; 2019(1): 5016810.
15. Song N, Kan S, Pang Q, Mei H, Zheng H, Li D, Cui F, Lv G, An R, Li P and Xiong Z: A prospective study on vulvovaginal candidiasis: multicentre molecular epidemiology of pathogenic yeasts in China. Journal of the European Academy of Dermatology and Venereology 2022; 36(4): 566-72.
16. Bitew A and Abebaw Y: Vulvovaginal candidiasis: species distribution of Candida and their antifungal susceptibility pattern. BMC Women's Health 2018; 18: 1-0.
17. Zaman R, Ullah I, Adeeb H and Arif A: Azoles resistance of candida species causing vulvo-vaginitis in reproductive age women at a tertiary care setting. Pakistan Journal of Medical Sciences 2022; 38(8): 2239.

How to cite this article:
Kamal R, Singh DP, Mittal N and Verma RK: Vulvovaginal candidiasis among females of reproductive age at a tertiary care center, Western Uttar Pradesh. Int J Pharm Sci & Res 2025; 16(4): 1007-13. doi: 10.13040/IJPSR.0975-8232.16(4).1007-13.