



## RETROSPECTIVE STUDY OF CANDIDA SPECIES IN VULVOVAGINAL CANDIDIASIS (VVC) PATIENTS IN REGIONAL REFERENCE LABORATORY OF WESTERN INDIA

### Clinical Microbiology

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### ABSTRACT

**Introduction:** the global burden of VVC is very high. Surveys suggest that about 75% of women develop vulvovaginal candidiasis (VVC) (thrush or yeast infection) at least once in their lifetime. The current study was designed to study microbiological characteristics of vulvovaginal candidiasis in symptomatic women of all age groups attending our tertiary care, reference institute in western India. **Material and methods:** The present study was a retrospective, laboratory based, conducted in Department of Microbiology, in tertiary care Hospital having regional reference lab for reproductive and sexually transmitted diseases in western India. The study period was from Jan 2020 to June 2022 (30 months). Data of total 1101 vaginal swabs were collected and analysed for microscopy & culture and speciation of candida was studied as per standard protocols. **Results:** Among 1101 swabs, 155 (14.07%) were tested positive for VVC. Age group of 31-35 showed maximum positivity rate of 15.5% as compared to all other age groups. Out of 155 isolates, 75 (48.38%) were candida albicans, and 80 (51.61%) were non albicans candida species (NAC) and mixed infections were seen in 6 samples (3.87%). **Discussion:** Total prevalence (14.07%) of VVC in our study is comparable to that of previous studies. Maximum prevalence of 15.5% was observed in age group of 31- 35 years and 14.82% was observed in age group of 26-30 which is little different as compared to other studies. **Conclusion:** C. albicans is the most common etiology but there is an ongoing increase in the prevalence of NAC species in VVC. Definitive laboratory procedures are of paramount importance to identify Candida isolates from suspected VVC cases to a species level to ensure appropriate and effective use of antifungal agents.

### KEYWORDS

Vulvovaginal Candidiasis, Thrush, Candida Albicans, Culture

#### INTRODUCTION:

About 75% of women develop vulvovaginal candidiasis (VVC) (thrush or yeast infection) at least once in their lifetime.<sup>1</sup>

Abnormal vaginal discharge also predisposes women to significant morbidity in the form of pelvic inflammatory diseases, infertility, endometriosis, cuff cellulitis, urethral syndrome, pregnancy loss, preterm labor, increase susceptibility to sexually transmitted infections (STI), including HIV.<sup>2,3</sup>

Diagnosis of vulvovaginal candidiasis is done by microscopic examination and culture, in the presence of compatible clinical signs and symptoms. 4 Recurrent episodes are more often caused by non-albicans species, for whichazole agents are less likely to be effective. 5 The estimated global burden of vulvovaginal candidiasis is already high. With the changing age trends of pregnant female population, prevalence of other diseases like diabetes that increase risk for VVC and use of newer intravaginal inserts like tampons, vaginal cup during menstruation, it is likely to increase.

The present study was designed to study microbiological diagnosis of vulvovaginal candidiasis in symptomatic women of all age groups attending our tertiary care.

#### Material and methods:

The present study was retrospective, laboratory based, conducted in Department of Microbiology, in tertiary care Hospital having regional reference lab for reproductive and sexually transmitted diseases in western India. The study period was from Jan 2020 to June 2022 (30 months). Vaginal swabs were collected from patients with abnormal vaginal discharge, vaginal irritation and curdy discharge attending gynecology OPD and STI clinic. The Inclusion Criteria were female patients in all age groups with the any of above mentioned complaints were considered for the study. The Exclusion Criteria were patients with bleeding per vagina, menstruating females and those who received vaginal antibiotics (pessary) in the past 3 weeks. The study was conducted on routine samples; hence, special consent for the study was not required.

The samples were processed for direct examination of the Candida

species on Sabouraud's dextrose agar (SDA) media (Himedia, MH063-500G). For direct microscopic examination, the swab was smeared on glass slide and stained with Gram's staining method and observed microscopically to see the presence or absence of budding yeast cells and pseudohyphae.

Once growth was seen on SDA, it was confirmed to be yeast by making secondary smear and Gram stain. All the isolates were purified on SDA plates. Swabs were considered positive for VVC if candida growth was present. Growth of Trichosporon spp. was not considered positive as it can be contamination from urinary tract. For identification of Candida spp., the colonies were inoculated on HI CHROM and Cormeal agar (CMA) and incubated at 250C for 24-72 hrs. Germ tube test was performed on day 1 of growth for anticipation of species. The plates were examined for the presence of growth, colour of growth on CHROM agar, sporulating structures and their arrangement on CMA. Isolation was considered significant only if the fungal growth coincided with the inoculation streaks and same species was obtained on both agar plates. Results of the culture were documented. Collected data was entered in Microsoft excel sheet and analysed. Statistical analysis was done by descriptive statistics.

#### RESULTS:

A total of 1101 vaginal swab records from the lab were retrieved, among which 155 (14.07%) were positive for VVC. Age wise distribution was studied and the results are as in table no. 1. Age group of 31-35 showed maximum positivity rate of 15.5% as compared to all other age groups. Higher positivity of around 15% was noted in age groups 26-30 and 46-50.

Out of 1101 swabs, 75 (48.38%) were candida albicans, and 80 (51.61%) were non albicans candida species (NAC) and mixed infections were seen in 6 samples (3.87%). NAC comprises of Candida glabrata, Candida tropicalis, Candida parapsilosis and Candida krusei. (Fig. 1)

**Table 1: Age wise positivity of VVC**

Age group (yrs)	Total no. of swabs received	No. of VVC positive patients	% Pos	Total number of isolates					
				C.albi cans	C.gla brata	C.tro pical	C.para psilosis	C.kr usei	Mix ed

20-24	243	30	12.34	17	6	4	1	0	2
25-34	501	76	15.16	32	16	12	10	3	3
35-44	283	38	13.42	20	7	7	3	0	1
45-60	73	11	15.06	6	3	2	0	0	0
Total	1100	155	14.09	75	32	25	14	3	6

Fig 1: Species wise distribution of Candida causing VVC.

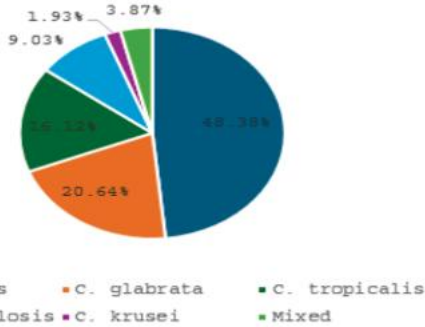


Fig 2: Candida spp. on SDA slant

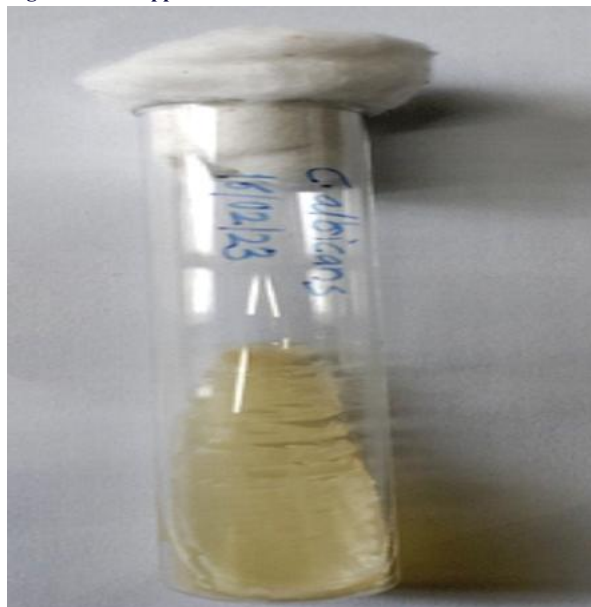


Fig 3: Budding yeast cells on Gram stain

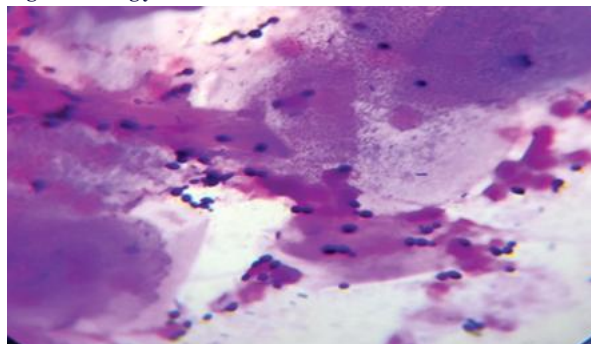


Fig 4: Positive Germ tube test

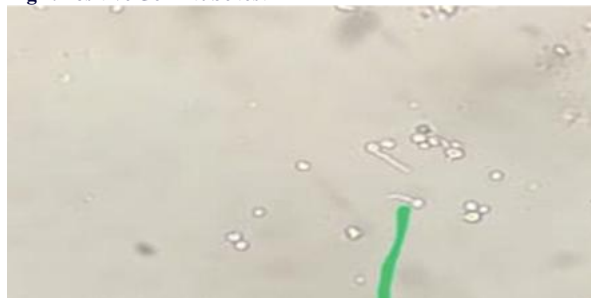
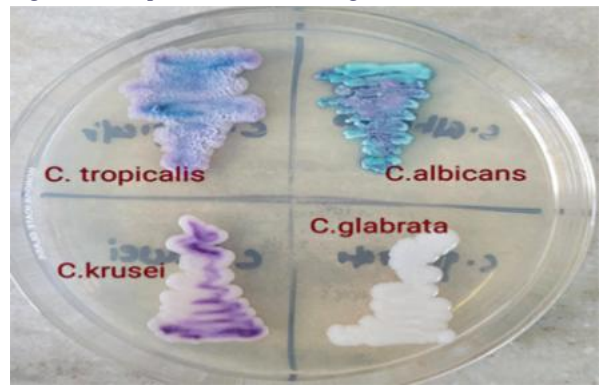


Fig 5: Candida species on Hi-Chrome agar



**DISCUSSION**

The present study reported a prevalence of vulvovaginal candidiasis (VVC) of 14.07% among 1101 vaginal swab samples. This rate is consistent with findings from several national and international studies, although variations exist depending on differences in study populations and diagnostic techniques. Goswami R et al. documented a prevalence of 12–15% among symptomatic women in India, closely aligning with our observations (6). Likewise, Vuyyuri R et al. (2022) reported a slightly higher prevalence of 17.3% in a hospital-based setting (7). In contrast, Jindal N et al. observed significantly higher rates ranging from 30% to 31.6%, possibly due to differences in methodology, inclusion criteria, and geographical variations (8). Overall, these comparisons indicate that the prevalence observed in this study reflects a moderate and consistent disease burden.

The highest positivity rate in this study was noted in the 31–35 years age group (15.5%), which is in agreement with established epidemiological trends showing that VVC predominantly affects women of reproductive age. Sobel JD reported that VVC is most common among women aged 20–40 years, largely due to hormonal influences (9). Similarly, Xie HY et al. (2022) identified increased susceptibility among women aged 25–35 years, attributing this to estrogen-related changes in vaginal flora and increased glycogen deposition (10). Elevated estrogen levels enhance glycogen content in vaginal epithelial cells, thereby promoting Candida growth and colonization.

A key observation of this study is the distribution of Candida species. Candida albicans accounted for 48.38% of isolates, while non-albicans Candida (NAC) species constituted a slightly higher proportion at 51.61%. Traditionally, C. albicans has been regarded as the primary causative organism, responsible for 85–95% of VVC cases, as described by Sobel JD (9). However, recent studies indicate a changing pattern. Hösükoğlu FG et al. (2022) reported NAC prevalence rates of 45–55%, closely matching the present findings (11). Similarly, Jannati B et al. (2024) documented NAC species in more than half of VVC cases, further supporting this emerging trend (12).

The increasing predominance of NAC species is clinically significant. Makanjuola O et al. suggested that this shift may be due to the widespread and often indiscriminate use of antifungal agents, particularly azoles, leading to selective pressure and the emergence of resistant strains (13). NAC species such as Candida glabrata, Candida tropicalis, and Candida krusei often exhibit reduced susceptibility or intrinsic resistance to commonly used antifungal drugs like fluconazole, making them important pathogens (13,14). Ali NA et al. (2024) also highlighted higher antifungal resistance rates among NAC isolates, emphasizing the need for accurate species identification and susceptibility testing (14).

Mixed infections were identified in 3.87% of cases in this study. Similar findings have been reported by Bitew A et al., who observed mixed Candida infections in approximately 3–5% of cases (15). Such infections are clinically important as they may contribute to persistent or recurrent disease and may lead to treatment failure, especially when resistant NAC species are involved.

The observed shift toward NAC species has important implications for clinical management. According to Bhosale VB et al. (2025), infections caused by NAC species are often associated with recurrent vulvovaginal candidiasis (RVVC) and reduced response to standard

antifungal therapy (16). This underscores the necessity for routine species-level identification and antifungal susceptibility testing rather than relying solely on empirical treatment.

Globally, it is estimated that nearly 75% of women experience at least one episode of VVC during their lifetime, with 5–8% developing recurrent infections, as reported by Jeanmonod R et al. (17). Given this substantial disease burden and the increasing prevalence of resistant NAC species, there is a pressing need for improved diagnostic approaches, rational antifungal usage, and ongoing epidemiological monitoring.

Overall, this study demonstrates a moderate prevalence of VVC, with the highest occurrence in women of reproductive age and a notable predominance of non-albicans *Candida* species. These findings are consistent with both classical and recent literature, highlighting a shifting epidemiological trend with important clinical and public health implications.

## CONCLUSION

The study found that vulvovaginal candidiasis (VVC) was present in 14.07% of women presenting with vaginal discharge, indicating a considerable burden in the study population. The highest prevalence in the 31–35 years age group suggests increased vulnerability among women in their reproductive and sexually active years. Importantly, non-albicans *Candida* (51.61%) slightly exceeded *Candida albicans* (48.38%), indicating an evolving trend toward NAC predominance. This shift is clinically relevant due to the reduced antifungal susceptibility often associated with NAC species. The occurrence of mixed infections, although limited, further highlights the importance of accurate laboratory diagnosis. Overall, the study emphasizes the need for species-level identification to guide effective antifungal therapy and improve clinical outcomes.

## Limitations

This study has several limitations. It was conducted in a single tertiary care center, which may limit the generalizability of the findings. Antifungal susceptibility testing was not performed, restricting the assessment of resistance patterns, particularly among non-albicans *Candida* species. Additionally, molecular techniques for precise species identification were not utilized, which may have resulted in under-detection of certain *Candida* species.

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