e-ISSN: 0975-9506, p-ISSN: 2961-6093

Available online on www.ijpqa.com

International Journal of Pharmaceutical Quality Assurance 2026; 17(5); 445-448

Original Research Article

# A Study of Antifungal Drug Sensitivity of Candida Isolated in Oral Cavity from HIV Infected Patients in A Tertiary Care Centre

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**Received: 18-03-2026 / Revised: 16-04-2026 / Accepted: 17-05-2026**

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**Conflict of interest: Nil**

**Abstract:**

**Introduction:** Oropharyngeal candidiasis (OPC) is a common opportunistic infection in HIV-infected individuals, with increasing antifungal resistance posing a therapeutic challenge. This study evaluated the distribution of Candida species and their antifungal susceptibility among HIV patients with OPC.

**Aims and Objectives:**

1. To isolate the Candida species and determine of antifungal drug susceptibility against fluconazole, itraconazole, nystatin, and clotrimazole in HIV seropositive patients with oropharyngeal candidiasis (OPC).
2. To compare the drug resistance and species diversity among people on HAART and not on HAART therapy.
3. To compare the drug resistance and species diversity among people having different cd4 counts.
4. To compare drug resistance pattern in our hospital with worldwide.
5. To study about different clinical patterns of oral candidiasis in HIV patients.

**Materials and Methods:** A cross-sectional study was conducted on 75 HIV-infected patients with OPC. Candida isolates were identified using conventional microbiological methods, and antifungal susceptibility to fluconazole, itraconazole, clotrimazole, and nystatin was assessed.

**Results:** Candida was isolated in 66.7% of patients, with Candida albicans being the predominant species (75%). Fluconazole showed the highest resistance (50%), while nystatin demonstrated better activity. Patients on HAART had lower isolation rates than those not receiving HAART.

**Conclusion:** Candida albicans remains the leading cause of OPC in HIV patients. The high rate of fluconazole resistance highlights the need for routine species identification and antifungal susceptibility testing to guide effective treatment.

**Keywords:** Oropharyngeal Candidiasis, HIV, Antifungal Drug Resistance.

**DOI:** 10.25258/ijpqa.17.5.67



## Introduction

Oropharyngeal candidiasis (OPC) is the most frequent opportunistic infection encountered in human immunodeficiency virus (HIV) infected individuals and is considered as an independent predictor of immunodeficiency in patients with AIDS. Though Candida albicans is the most common isolated species of the oral mucosa, other Candida species, such as C. tropicalis, C. krusei, C. parapsilosis and C. glabrata have also been recovered increasingly. The azoles, particularly fluconazole, remain among the most common antifungal drugs, but their intensive clinical use for both therapy and prophylaxis has led to the emergence of resistant strains. Although many studies have been conducted on oropharyngeal candidiasis in HIV population across the country, there is paucity of such studies in the southern part of India. Thus the present study was carried out to determine the species distribution and antifungal susceptibility profile of oropharyngeal Candida isolates from HIV infected patients.

### Aims and Objectives

1. To isolate the Candida species and determine of antifungal drug susceptibility against fluconazole, itraconazole, nystatin, and clotrimazole in HIV seropositive patients with oropharyngeal candidiasis (OPC).

2. To compare the drug resistance and species diversity among people on HAART and not on HAART therapy.
3. To compare the drug resistance and species diversity among people having different cd4 counts.
4. To compare drug resistance pattern in our hospital with world wide.
5. To study about different clinical patterns of oral candidiasis in HIV patients.

**Materials and Methods**

The present study was a institutional cross-sectional study carried out in our hospital 1.5 years. 75 HIV infected patients with OPC, 55 under HAART and 20 not under HAART, were recruited.

Inclusion criteria were a previous positive diagnosis of HIV, willingness to participate in the study, a presumptive diagnosis of OPC following an appropriate complaint made at the clinic visit, and no history of antifungal therapy within two weeks prior to the attendance.

**Specimen Collection and Transportation:** Oropharyngeal swabs were taken from oral lesions, oral cavity mucosa, and dorsal surface of the tongue and the floor of the mouth of each patient with sterile swabs. All samples were then inoculated in to brain-heart infusion broth. Then transported to the Microbiology Laboratory of our college.

**Inoculation and Incubation**

The brain-heart infusion broth was then subcultured onto Sabouraud Dextrose Agar (SDA) supplemented with chloramphenicol and incubated aerobically for 48 hours. Plates with no growth after 48 hours were re incubated for a further 24 hours.

**Identification:** Candida was identified and species separation was done by employing conventional biochemical and assimilation test procedures using CHROMagar Candida culture medium, germ-tube formation in human serum, and production of blastoconidia, pseudohyphae, and chlamydospore on cornmeal agar.

**Determination of the Antifungal Profile of Yeast Isolates:** The in vitro antifungal susceptibility pattern of yeast isolates to four antifungal agents, fluconazole, Itraconazole, clotrimazole, and nystatin was determined by strip method and disc method.

**Results**

In the present study, a total of 75 clinical samples were collected from HIV-sero-positive individuals with OPC of which 45(60%) were from female patients and 30 (40%) were from male patients. The ages of study subjects ranged from 3 to 78 years with a median age of 34.5 years. Among the study participants, 55 (77.3%) were under HAART 20 (23.7%) were not under HAART.

The clinical pattern of candidiasis were 90% of the cases had pseudomembranous type,5% atrophic type and 5% angular chelitis type are observed. More than 70% of patients had Cd4 count less than 200.And remaining 30% had cd4 count more than 200.

**In Vitro Susceptibility of Isolates:** 45% of the isolates were susceptible to all the antifungal drugs.

60% of the c.albicans is sensitive to all drugs.30% of the species were resistant to flucnazole.10%of the species were resistant to all drugs.25% ,15%,15% were resistant to Itraconazole, clotrimazole and nystatin.

50% c.tropicalis species were resistant to all drugs.100% resistance were noted for flucanazole and clotrimazole &75% resistant were observed for both itraconazole and Nystatin.

**Distribution of Yeast Isolates:** Out of a total of 75 study subjects, 50 yeast isolates were recovered giving a prevalence of 66.7% colonization rate.

Of 50 yeast isolates recovered from HIV patients with OPC, 15 isolates were from patients that were not under HAART and 35 isolates were from patients that were under HAART. Difference in yeast isolation rate between patients under HAART and those that were not under HAART was statistically significant. C. albicans was the most frequently isolated species accounting 75% of the total yeast isolates followed by C. glabrata, 10% C. tropicalis, 10% C. parasilosis, 5%. Five patients had mixed infections and C. albicans appeared in all mixed infections.

50% of the c.glabarata were resistsnt to all drugs. Nystatin and clotrimazole were sensitive in 50% of the isolates. Both flucnazole and itraconazole were resistant to all isolates.

All isolates of c.parasilosis is resistant to flucanazole and itraconazole and all isolates are sensitive to both nystatin and clotrimazole. Resistance observed in this study Flucanazole 50%, Itraconazole 40%, clotrimazole 35%, Nystatin 25%.

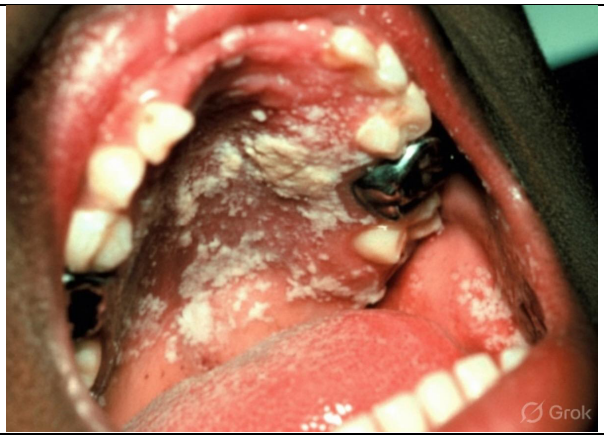


**Figure 1: Pseudomembranous type of oral candidiasis**

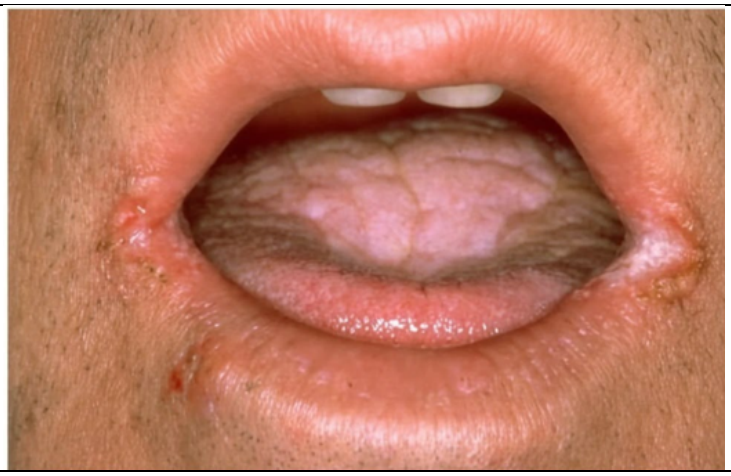

**Figure 2: Atrophic oral candidiasis and angular chelitis**

## Discussion

Oropharyngeal candidiasis (OPC) remains one of the most common opportunistic infections among people living with HIV, particularly in patients with advanced immunosuppression and low CD4 counts. In the present study, Candida species were isolated from 66.7% of HIV-infected patients with clinical features of OPC. This finding is comparable to several studies from India and other developing countries, where the prevalence of oral candidiasis among HIV-infected individuals has ranged from approximately 50% to 80%, depending on the study population, degree of immunosuppression, and antiretroviral therapy status.

The majority of isolates in the present study were Candida albicans (75%), making it the predominant etiological agent. This observation is in agreement with studies by Pfaller et al,[1] Samaranayake et al. [2] and several Indian investigators, who reported C. albicans as the most frequently isolated species in HIV-associated oral candidiasis. The predominance of C. albicans is attributed to its ability to adhere to oral epithelial cells, form biofilms, and produce virulence factors such as phospholipases and proteinases. However, the isolation of non-albicans Candida species including C. tropicalis, C. glabrata, and C. parapsilosis in the present study reflects the changing epidemiological trend reported worldwide.

An increasing prevalence of non-albicans Candida species has been observed in recent years, particularly among patients receiving prolonged antifungal therapy or HAART. Similar findings have been reported by Sardi et al. [3] who suggested that repeated exposure to azole antifungals may select resistant non-albicans species. The presence of mixed Candida infections observed in our study has also been documented by previous investigators and may contribute to treatment failure because of differing antifungal susceptibility profiles.

The present study demonstrated considerable resistance to fluconazole, with lower resistance observed for itraconazole, clotrimazole, and nystatin. Fluconazole resistance was particularly common among non-albicans Candida isolates. Similar resistance patterns have been described in studies by Pfaller and Diekema [1] and by Pappas et al. [4] who reported increasing azole resistance associated with widespread fluconazole use for treatment and

prophylaxis in HIV-infected patients. Fluconazole resistance has been attributed to alterations in the ERG11 gene, overexpression of efflux pumps, and biofilm formation, all of which reduce antifungal efficacy.

Among the non-albicans Candida species, C. glabrata and C. tropicalis exhibited higher resistance rates than C. albicans. These findings are consistent with previous reports demonstrating the intrinsic or acquired reduced susceptibility of these species to azole antifungal agents. In contrast, nystatin retained relatively good activity against most isolates, supporting its continued role in the management of uncomplicated oral candidiasis.

The present study also found a higher frequency of Candida isolation among patients with CD4 counts below 200 cells/mm³. This finding agrees with studies by Patton et al. [5] and Greenspan et al. [6] who demonstrated that declining CD4 counts are strongly associated with increased susceptibility to opportunistic fungal infections. Reduced cellular immunity facilitates colonization and invasion of the oral mucosa by Candida species.

Patients receiving HAART showed lower rates of Candida isolation compared with those not receiving antiretroviral therapy. Similar observations have been reported in numerous studies, indicating that immune reconstitution following HAART significantly reduces the incidence of opportunistic infections, including oral candidiasis. Nevertheless, antifungal resistance continues to be encountered even among patients receiving HAART, emphasizing the importance of routine susceptibility testing.

Overall, the findings of the present study support the global trend of persistent predominance of C. albicans along with an increasing emergence of non-albicans Candida species and rising azole resistance. These observations highlight the importance of accurate species identification and antifungal susceptibility testing before initiating therapy, particularly in HIV-infected individuals with recurrent or refractory oral candidiasis.

## Conclusion

The present study demonstrated that Candida albicans was the predominant species causing oropharyngeal candidiasis in HIV-infected patients, although non-albicans Candida species were also frequently isolated. A high level of resistance to fluconazole was observed, highlighting the emerging problem of antifungal resistance. Patients receiving HAART had a lower rate of Candida isolation compared to those not on HAART. Routine species identification and antifungal susceptibility testing are essential for appropriate antifungal therapy and improved management of HIV-associated oral candidiasis.

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