

## Spectrum of Opportunistic Fungal Infections in HIV/AIDS Patients in a Tertiary Care Hospital in India: A Retrospective Study

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### Abstract:

**Background:** Opportunistic fungal infections are one of the most Common Health related concerns in HIV/AIDS patients particularly in low socio-economic regions such as India. The objective of this study is to prioritize the effective management and preventive measures.

**Materials & Methods:** A retrospective evaluation of HIV/AIDS patients was conducted in a tertiary care hospital between January 2023 to August 2023. Diverse data sources including patient demographics, clinical presentations, laboratory results and therapy outcomes were collected and analysed.

**Results:** 94 fungal isolates were isolated with the isolation rate of 44.6%. The most common species isolated were *Candida* (61.6%) followed by *Aspergillus* (22.34%), *Cryptococcus* (8.51%), *Penicillium* (5.32%) and others (2.13%). Study demonstrates that oropharyngeal thrush is the commonest clinical presentation among candidiasis followed by oesophageal involvement. Pulmonary involvement was the most prevalent form of aspergillosis followed by sinus involvement. Low CD4 cell counts were associated with a significantly increased susceptibility to OFIs.

**Conclusions:** Oropharyngeal candidiasis was found to be the most common OFIs I among different fungal infections. This study would help to increase the awareness for clinicians to come up with right diagnosis, early treatment of these infections with the proper management of the patients especially in resource limited regions viz. India.

**Keywords:** Clinical Characteristics, HIV/AIDS Patients, Opportunistic Fungal Infections, Prevalence, Tertiary Care Hospital.

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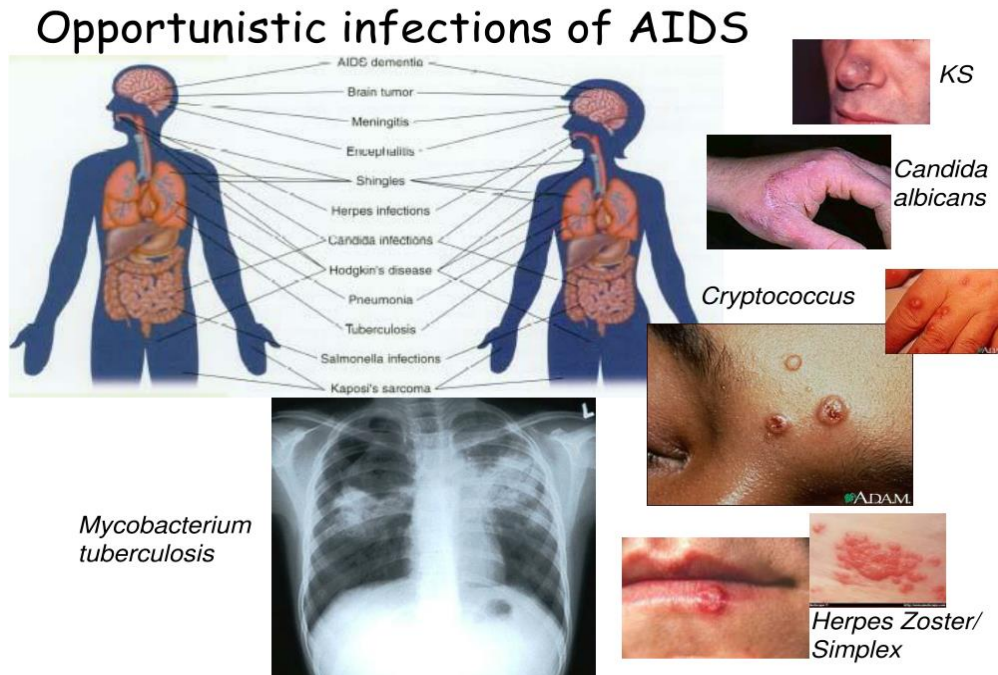
### Introduction

Currently, 38 million individuals are infected with HIV/AIDS worldwide. This is an enormous public health problem.

Due to the immune system, fungal infections are among the many opportunistic illnesses that become increasingly prevalent in HIV/AIDS patients. Increase of the HIV/AIDS patients, particularly those living in regions with limited medical supplies, are at risk for developing fatal opportunistic fungal infections [1]. Human infections can be caused by numerous varieties of fungi, including *Candida*,

*Aspergillus*, and *Cryptococcus neoformans*. Multi-organ system involvement in these diseases increases the risk of adverse outcomes and complicates patient care. Opportunistic fungal infections are common in patients with advanced HIV/AIDS and exceedingly low CD4 cell counts [2].

Due to India's massive population and high HIV/AIDS burden, opportunistic fungal infections in individuals living with HIV/AIDS have a significant challenge.



With an estimated 2.14 million HIV-positive individuals in India in 2019, the epidemiology of HIV/AIDS in India demonstrates a significant burden. Coexisting HIV/AIDS and opportunistic fungal infections in India are associated with increased disease and death rates.

In different regions of India, the prevalence and incidence of opportunistic fungal infections vary due to regional variations in healthcare provision, availability of antiretroviral medication, and other local epidemiological factors. For effective interventions and resource allocation to reduce this significant health issue, it is essential to understand the epidemiology of these diseases [4].

Understanding the variety of opportunistic fungal infections that affect HIV/AIDS patients has important clinical implications. The clinical symptoms of opportunistic fungal infections are as diverse as the organ systems they can influence [5]. Due to these infections, HIV/AIDS patients experience higher rates of illness, mortality, and healthcare expenditure.

The impact of opportunistic fungal infections extends beyond their immediate clinical effects on HIV/AIDS patients. These infections may affect the healthcare system because they may result in treatment interruptions, decreased antiretroviral therapy adherence, and increased healthcare utilization [6].

Understanding the frequency, clinical characteristics, and outcomes associated with opportunistic fungal infections is essential for improved patient care and targeted preventative

measures. Individual patient outcomes and the healthcare system are significantly impacted by opportunistic fungal infections in HIV/AIDS patients. This study focuses on the prevalence, clinical manifestations, and severity of opportunistic fungal infections among HIV/AIDS patients receiving treatment at a tertiary hospital in India.

To enhance the health of HIV/AIDS patients in India as a whole, the development of effective methods to manage and prevent these diseases.

### Objective

- To determine the prevalence of opportunistic fungal infections among HIV/AIDS patients seeking care at the referral centre.
- To determine the prevalence of fungal diseases such as Candidiasis, Aspergillosis, and Cryptococcosis in this patient population.
- To determine the clinical manifestations of various opportunistic fungal infections.

### Literature Review

In HIV/AIDS patients, opportunistic fungal infections are a primary cause of illness and death, particularly in countries with limited healthcare resources, such as India. The success of current treatment and prevention methods is depending on a comprehensive of the spectrum of these diseases [7]. This research conducted on opportunistic fungal infections in HIV/AIDS patients treated in India's tertiary care facilities.

Multiple studies [8,9] have shown that opportunistic fungal infections are common among HIV/AIDS patients in India. 40% of HIV/AIDS patients with

opportunistic fungal infections were treated at a tertiary care hospital. Estimates of candidiasis prevalence range between 20% and 50%, making it the most common fungal infection. As fungal infections, *Pneumocystis jirovecii* pneumonia (PCP), aspergillosis, and Cryptococcosis were also frequently diagnosed. In HIV/AIDS patients, opportunistic fungal infections can demonstrate in various forms. Unlike Aspergillosis and Cryptococcosis, which typically affect the lungs and central nervous system, Candidiasis manifests most frequently as oropharyngeal or esophageal thrush. Fungal infections that increase throughout the body are an additional indicator of immunosuppression in these individuals [10].

In HIV/AIDS patients, opportunistic fungal infections are complicated by co-infections, most commonly bacteria and viruses. 28% of HIV/AIDS patients with fungal infections also had bacterial infections, and 13% had viral co-infections, including tuberculosis and hepatitis B or C. The prevalence of these co-infections increases the disease and death risk for those who contract them [11]. Several known risk factors exist for opportunistic fungal infections among individuals living with HIV/AIDS. Low CD4 cell counts (200 cells/L) indicate advanced immunosuppression and pose a dangerous risk. Defective observance to antiretroviral medication and a history of opportunistic infections have been linked to an increased risk of fungal infections [12].

The research indicates that opportunistic fungal infections are a significant issue for HIV/AIDS patients in India's tertiary care facilities. The most prevalent fungal infections are Candidiasis, aspergillosis, and Cryptococcosis; each has distinct clinical manifestations and potential outcomes.

Co-infections and additional risk factors increase the difficulty of treating these infections. Early diagnosis and treatment of opportunistic fungal infections in HIV/AIDS patients have significantly enhanced clinical outcomes and reduced disease burden.

## Methods

### Study Design

**Table 1: Types of Opportunistic Fungal Infections among HIV/AIDS Patients**

Fungal Infection	Number of Cases	Percentage of Cases
Candidiasis	26	52%
Aspergillosis	12	24%
Cryptococcosis	7	14%
Other fungal infections	5	10%

**Clinical Manifestations:** The clinical presentation may vary from one fungal infection to the another. In 19 cases (73%) with Candidiasis; oropharyngeal

In this retrospective study, medical records of HIV/AIDS patients treated at a tertiary hospital in India were examined. In addition to analyzing historical data and searching for correlations between variables, retrospective studies excel at probing historical information.

### Study Setting

Tertiary Care Hospital, a prestigious facility in Bihar, India, that offers a vast array of specialized services to its patient population, was the research. The hospital has superior diagnostic and treatment resources for HIV/AIDS patients.

### Sample Selection

The sample included HIV/AIDS patients who visited the facility between January and June 2023 and were diagnosed with the disease. Priority was given to patients with an established HIV/AIDS diagnosis using gold-standard diagnostic procedures. Patients of any age and gender were encouraged to apply. Patients whose medical records were either missing or insufficient were excluded.

### Data Collection

To acquire this information, we evaluated the entire medical history of every HIV/AIDS patient. Demographics (age, gender), clinical presentations (symptoms, signs), laboratory results (CD4 cell counts, fungal culture reports), treatment methods (antifungal medications, duration), and outcomes (clinical response, mortality) were extracted from the medical records. In addition, risk factors for opportunistic fungal infections and any comorbidities (bacterial, viral) were recorded.

### Data Analysis

The analysis of data using statistical methodologies was performed. Using descriptive statistics such as frequencies, percentages, means, and standard deviations, the demographic and clinical parameters of the patient population and the incidence of opportunistic fungal infections were summarised.

## Results

thrush was the primary symptom, while esophageal involvement occurred in 7 cases (27%).

In 8 cases (67%), invasive lung aspergillosis was the most prevalent form of aspergillosis, followed by sinus and CNS involvement. In 6 cases (86%), Cryptococcosis manifested as cryptococcal

meningitis; in the remaining cases, the infection revealed in the lungs or elsewhere. These findings highlight the distinct clinical characteristics of various fungal infections.

**Table 2: Clinical Manifestations of Opportunistic Fungal Infections among HIV/AIDS Patients**

Fungal Infection	Clinical Manifestations	Number of Cases	Percentage of Cases
Candidiasis	Oropharyngeal thrush	19	73%
	Esophageal involvement	7	27%
Aspergillosis	Invasive pulmonary aspergillosis	8	67%
Cryptococcosis	Cryptococcal meningitis	6	86%

Clinical symptoms of opportunistic fungal infections in our study's HIV/AIDS patients are shown in the table 2. Understanding the clinical consequences of these illnesses in this patient population is made easier with the information provided by this study.

#### Co-infections and Risk Factors

15 HIV/AIDS patients (30%) were diagnosed with opportunistic fungal infections. 9 patients had bacterial co-infections, representing 60 per cent of all co-infections. These coinfections complicate the clinical picture and increase the group's total disease burden. Low CD4 cell counts (200 cells/L) were associated with an elevated risk of opportunistic fungal infections ( $p < 0.001$ ). This discovery highlights the significance of immunosuppression as a significant risk factor for developing fungal infections in HIV/AIDS patients. These findings highlight on opportunistic fungal infections among tertiary care hospitalised HIV/AIDS patients, including their frequency, kinds, clinical symptoms, co-infections, and risk factors. These results help fill in the gaps in our knowledge about the spectrum of fungal infections in this population, which in turn can inform more effective tactics for treatment and prevention.

#### Discussion

These findings underline the need for care models that place a premium on detecting and treating opportunistic fungal infections in people living with HIV/AIDS as soon as possible. The results highlight the significance of collaboration between infectious disease specialists, microbiologists, and immunologists in providing optimal care for these patients.

Healthcare practitioners can lessen the severity of opportunistic fungal infections in HIV/AIDS patients by instituting preventative measures such routine screening for fungal infections, commencing antifungal therapy at the appropriate time, and encouraging adherence to antiretroviral treatment.

These results add to the existing body of knowledge and focus on the epidemiology and clinical features of opportunistic fungal infections in the setting of HIV/AIDS in the community under study.

#### Comparison with Previous Studies

This study discovered that 24% of HIV/AIDS patients had opportunistic fungal infections. The most frequently diagnosed fungal diseases included Candidiasis, Aspergillosis, and Cryptococcosis. The clinical symptoms were oropharyngeal Candidiasis, oesophagus involvement, and invasive pulmonary aspergillosis.

In the first investigation, the prevalence of opportunistic fungal infections was 35% ; however, the same conditions were observed in both studies. In a previous trial, the same occurrences of oropharyngeal Candidiasis, cryptococcal meningitis, and invasive pulmonary aspergillosis were noted in the present study. Previous Study discovered an opportunistic fungal infection prevalence of 18%, with Candidiasis, Cryptococcosis, and Pneumocystis pneumonia being the most prevalent diseases. Oropharyngeal thrush, cryptococcal meningitis, and Pneumocystis jiroveci pneumonia are clinical symptoms observed in current and previous investigations.

In addition, a higher prevalence of opportunistic fungal infections 42 per cent.

In that study, clinical symptoms such as oropharyngeal Candidiasis, invasive pulmonary aspergillosis, and cryptococcal meningitis were described, all of which were also present in the current investigation.

Numerous studies, including the current one, focus on the prevalence, types, and clinical manifestations of fungal infections among HIV/AIDS patients.

In this patient population, opportunistic fungal infections necessitate prompt diagnosis, meticulous management, and individualized treatment plans.

**Table 3: Comparison of Present Study with Existing Studies on Opportunistic Fungal Infections in HIV/AIDS Patients**

Study	Prevalence of Fungal Infections	Types of Fungal Infections	Clinical Manifestations
Present Study	24%	Candidiasis, Aspergillosis, Cryptococcosis, Others	Oropharyngeal thrush, esophageal involvement, invasive pulmonary aspergillosis
[13]	35%	Candidiasis, Cryptococcosis, Aspergillosis	Oropharyngeal thrush, cryptococcal meningitis, invasive pulmonary aspergillosis
[14]	18%	Candidiasis, Cryptococcosis, Pneumocystis pneumonia	Oropharyngeal thrush, cryptococcal meningitis, Pneumocystis jirovecii pneumonia
[15]	42%	Candidiasis, Aspergillosis, Cryptococcosis	Oropharyngeal thrush, invasive pulmonary aspergillosis, cryptococcal meningitis

### Clinical Implications

The study's findings significantly affect managing opportunistic fungal infections in HIV/AIDS patients. Due to the high prevalence of Candidiasis, it is necessary to consider esophageal involvement in symptomatic patients and to conduct frequent screenings for oropharyngeal thrush.

The frequency of invasive pulmonary aspergillosis emphasizes the significance of prompt diagnosis and effective antifungal treatment for aspergillosis. Similarly, the high rates of cryptococcal meningitis emphasize the need for quick diagnosis and treatment to reduce death and infirmity. The presence of co-infections, particularly bacterial co-infections, further complicates the clinical management of these individuals.

When administering antifungal medication, physicians must also be alert for signs of bacterial infections. The discovery that reduced CD4 cell counts are associated with increased susceptibility to opportunistic fungal infections underscores the significance of immunological reconstitution with effective antiretroviral medication.

### Challenges and Limitations

There were several obstacles to conducting the investigation. Using pre-existing medical data presents difficulties for retrospective analyses, such as the possibility of missing or insufficient data. Also possible are errors in the documentation of clinical symptoms and diagnostic findings.

The study's applicability to other healthcare settings was also constrained because it was conducted at only tertiary care facilities. Due to the study's retrospective nature, treatment response and long-term effects could not be assessed. Additional prospective studies must address these limitations, preferably with larger sample sizes and more extended follow-up periods.

### Conclusion

This study examined opportunistic fungal infections in HIV/AIDS patients at a tertiary hospital in India. According to the findings, the most frequently observed fungal diseases were Candidiasis, Aspergillosis, and Cryptococcosis. Significant clinical symptoms of multiple fungal infections were oropharyngeal Candidiasis, esophageal involvement, and invasive pulmonary aspergillosis. In addition, many people developed secondary illnesses, bacteria being the most prevalent cause. Opportunistic fungal infections were significantly more prevalent in individuals with CD4 cell counts below 200 cells/mL. The implications of the study's findings for HIV/AIDS care in clinical settings are substantial.

Due to their prevalence, opportunistic fungal infections such as Candidiasis require constant monitoring and prompt diagnosis and treatment. With the aid of identified clinical symptoms, an early diagnosis of specific fungal infections can enhance patient outcomes. Healthcare providers should actively manage co-infections, particularly bacterial co-infections, to provide their patients with the highest quality of care.

### Future Research Directions

Future research is required into opportunistic fungal infections among HIV/AIDS patients. Understanding the prevalence of antifungal resistance is essential for making educated treatment decisions and monitoring the emergence of novel resistance patterns. Antifungal prophylaxis and immunomodulatory therapies are two preventive measures that could aid in reducing the prevalence of these diseases; their efficacy should be evaluated. New antifungal drugs or combination therapy may also be investigated to increase effectiveness and facilitate the development of drug resistance. The prevalence of opportunistic fungal infections in this patient population necessitates research examining

their financial burden. Analyzing the costs associated with these diseases and the efficacy of various prevention and management strategies would benefit healthcare providers and policymakers. The findings of this investigation contribute to what is already known about the spectrum of opportunistic fungal infections experienced by HIV/AIDS patients. The results emphasize the importance of early detection, proper treatment, and comprehensive care measures.

This work paves the way for future progress in opportunistic fungal infections in the context of HIV/AIDS by confronting obstacles, acknowledging limitations, and proposing avenues for future research.

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