



## Mycological Profile of Fungal Isolates from Clinical Specimens in a Tertiary Care Hospital of Western Maharashtra: A Retrospective Laboratory-Based Study

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### Abstract

#### Introduction:

Clinical Mycology is gaining importance due to advances in the Medical field, like transplantations and cancer therapy, which have increased the pool of immuno-deficient humans susceptible to fungal infections. Therefore, This study was planned to investigate the prevalence of fungal infection with respect to different sites involved and its clinical correlation from tertiary care hospitals.

#### Material and Methods:

The present study was a Retrospective Laboratory-Based Study with a total of 884 samples from patients suspected of fungal infections received over 2 years. Samples were processed by standard microbiological methods.

#### Result:

A total of 884 clinical specimens from patients with suspected fungal infections were processed during the study period. Direct microscopy using KOH mount was positive in 136 (15.4%) specimens, while fungal culture yielded growth in 246 (27.8%) specimens. The majority of samples were obtained from patients aged 12–40 years (50.7%), with a male predominance (57.9%). Skin scrapings were the most common specimens received. Candida species were the predominant fungal isolates, accounting for (62.2%) of culture-positive isolates, followed by dermatophytes, predominantly Trichophyton species (15%), and Mucorales (8%). Culture demonstrated a higher detection rate than direct microscopy and remained the most reliable method for fungal identification.

#### Conclusion:

Fungal infections continue to contribute significantly to patient morbidity in tertiary care settings. Candida species were the most frequently isolated fungi, followed by dermatophytes. Fungal culture remains an essential diagnostic tool for the accurate detection and identification of fungal pathogens, facilitating timely diagnosis and appropriate antifungal therapy.

**Keywords:** Candida, dermatophytes, Trichophyton, Mucor

### Introduction

The total scenario about the epidemiology of fungal infections has changed. The fungal isolates, which used to be discarded as contaminants play a significant

role in pathogenicity of the most infections. These organisms are now capable of affecting not only the immunocompromised patients but also healthy

immunocompetent individuals [1, 2]. Clinical Mycology is gaining importance as advances in the Medical field, like transplantations and cancer therapy, increased in the pool of immuno-deficient humans, has increased susceptibility to fungal infections.[1] This has changed the prevalence pattern of fungal isolate, yeast is now the most common isolate as compared to dermatophytes.[2] India has a hot and humid climate that is highly favourable for fungal infections. The nature of dermatomycoses changes with the passage of time, living conditions, and adapting preventive measures and hygiene.[3] Rapid diagnosis of systemic fungal infections is very limited and culture detection of fungal isolates is often a delayed process due to slow or absent growth of fungal isolates from clinical samples [1]. Laboratory research work is needed for better isolation of these pathogens and improved diagnostic methods. This retrospective analysis was therefore planned to investigate the prevalence of fungal infection concerning different sites involved, along with clinical correlation in a tertiary care hospital.

### Methodology

This retrospective laboratory-based observational study was conducted in the Department of Microbiology of a tertiary care teaching hospital in Western Maharashtra over a period of two years.

### Inclusion Criteria

All clinical specimens received in the mycology laboratory from patients clinically suspected of fungal infections during the study period were included in the study. These specimens included skin scrapings, nail clippings, hair samples, sputum, blood, urine, pus, corneal scrapings, tissue biopsies, vaginal swabs, body fluids, and other samples submitted for fungal investigations.

### Exclusion Criteria

The following specimens were excluded from the study:

1. Duplicate samples received from the same patient during the same episode of illness.
2. Samples with incomplete patient information or improper labelling.
3. Leaking, contaminated, or improperly transported specimens.

### 4. Samples with inadequate quantity for processing.

After receipt in the laboratory, specimens were processed according to standard microbiological procedures. Direct microscopic examination was performed using potassium hydroxide (KOH) mount for the detection of fungal elements. Gram staining was carried out whenever yeast infection was suspected.

For fungal culture, specimens were inoculated onto Sabouraud Dextrose Agar (SDA), both plain and SDA supplemented with chloramphenicol and cycloheximide. One set of culture media was incubated at 25°C and another at 37°C. The cultures were examined periodically and followed for up to four weeks before being reported as negative.

Yeast isolates were identified based on colony morphology, Gram stain findings, germ tube test, and CHROMagar Candida characteristics. Filamentous fungi and dermatophytes were identified by their macroscopic colony morphology and microscopic features observed on Lactophenol Cotton Blue (LPCB) mount and slide culture preparations.

To minimize contamination, all specimens were processed using standard aseptic laboratory practices. Quality-control procedures for culture media were routinely followed. The interpretation of fungal growth was done considering the specimen type and microscopy findings. Isolates recovered from non-sterile specimens such as sputum, urine, vaginal swabs, skin, and nail samples were interpreted cautiously, as these may represent colonization or contamination rather than true infection.

A culture was considered positive when fungal growth was obtained and identified by standard microbiological methods. The study primarily describes the laboratory profile of fungal isolates, and differentiation between colonization and true infection was not possible in all cases because of the retrospective nature of the study.

Data regarding patient demographics, specimen type, microscopy findings, and culture results were collected from laboratory records. The data were entered into Microsoft Excel and analysed using descriptive statistics. Results were expressed as frequencies and percentages. No inferential statistical analysis was performed as the objective of the study

was to describe the prevalence and distribution of fungal isolates.

The Institutional Ethics Committee granted exemption because of the retrospective laboratory-based design."

## Results

A total of 884 clinical specimens from patients with suspected fungal infections were processed during the two-year study period. Of these, 136 (15.4%) specimens were positive on direct microscopy by KOH mount, while 246 (27.8%) yielded fungal growth on culture.

### Correlation of KOH Mount and Fungal Culture

Of the 884 specimens processed, 113 (12.7%) were positive by both KOH mount and fungal culture. Twenty-three (2.6%) specimens were positive by KOH mount but negative on culture, whereas 133 (15.0%) specimens were culture-positive despite negative KOH findings. The remaining 615 (69.6%) specimens were negative by both methods (Table 1).

### Demographic Distribution

Among the study population, 512 (57.9%) specimens were received from male patients and 372 (42.1%) from female patients, giving a male-to-female ratio of 1.37:1.

The majority of specimens were obtained from patients in the 12–40 years age group (448; 50.7%), followed by patients older than 40 years (237; 26.8%) and those younger than 12 years (199; 22.5%) (Table 2).

### Distribution of Clinical Specimens

Skin scrapings constituted the largest proportion of specimens received (188; 21.3%), followed by sputum (141; 15.9%), blood (146; 16.5%), corneal scrapings (104; 11.8%), nail scrapings (98; 11.1%), urine (74; 8.4%), vaginal swabs (32; 3.6%), pus (30; 3.4%), tissue biopsies (36; 4.1%), abscess specimens (13; 1.5%), body fluids (43; 4.9%), and hair samples (4; 0.5%) (Figure 1).

### Culture Positivity According to Specimen Type

Among the culture-positive specimens, the highest number of fungal isolates was recovered from skin scrapings (51 isolates), followed by sputum (44 isolates), blood (38 isolates), nail scrapings (30 isolates), corneal scrapings (18 isolates), body fluids

(15 isolates), nasal scrapings (14 isolates), pus (10 isolates), abscess specimens (9 isolates), urine (9 isolates), tissue biopsies (4 isolates), and vaginal swabs (4 isolates). No fungal growth was recovered from hair samples (Figure 2).

### Distribution of Fungal Isolates

A total of 246 fungal isolates were recovered from culture-positive clinical specimens during the study period. *Candida* species were the predominant isolates, accounting for 153 (62.2%) of all fungal isolates. Among the *Candida* isolates, *Candida albicans* was the most frequently isolated species, contributing 45 (18.3%) isolates, followed by other *Candida* species 85 (34.5%), *Candida guilliermondii* 12 (4.9%), *Candida glabrata* 7 (2.8%), and *Candida krusei* 4 (1.6%).

Among the mould isolates, dermatophytes, predominantly *Trichophyton* species, were the most common, accounting for 37 (15.0%) isolates. Other fungi recovered included *Aspergillus* species 11 (4.5%), *Fusarium* species 9 (3.7%), *Rhizopus/Mucor* species 5 (2.0%), *Bipolaris* species 4 (1.6%), and *Alternaria* species 3 (1.2%). Less frequently isolated fungi included *Cladosporium* species and *Cladophialophora carrionii* with 2 (0.8%) isolates each, while *Geotrichum capitatum* and *Microsporium canis* were isolated once each (0.4%).

Overall, *Candida* species constituted the largest group of fungal isolates, followed by dermatophytes represented predominantly by *Trichophyton* species. The detailed species-wise distribution of fungal isolates is presented in **Table 3**, while comparison with previous studies is shown in **Table 4**.

### Discussion

Fungal infections continue to pose a significant diagnostic and therapeutic challenge, particularly in developing countries where environmental conditions favour fungal growth and where increasing numbers of patients are exposed to immunosuppressive therapies and invasive medical procedures.[1,4] The present retrospective laboratory-based study was undertaken to evaluate the spectrum of fungal isolates recovered from clinical specimens received in a tertiary care hospital in Western Maharashtra.

In the present study, fungal culture positivity was observed in 27.8% of clinical specimens, while direct

microscopy by KOH mount demonstrated positivity in 15.4% of cases. Culture detected a greater number of positive cases than direct microscopy, highlighting its importance as a confirmatory diagnostic tool. Similar observations have been reported by Oz and Kiraz, who emphasized the limitations of direct microscopy and the importance of laboratory methods for diagnosis of fungal infections.[5]

The majority of specimens were obtained from patients belonging to the 12–40-year age group, with a male predominance. Similar demographic patterns have been reported in Indian studies evaluating the epidemiology of fungal infections.[2,6]

Skin scrapings constituted the most common clinical specimen received during the study period. This finding is consistent with the high prevalence of superficial fungal infections reported from tropical countries, including India.[3,6] Warm and humid climatic conditions prevalent in Western Maharashtra may contribute to the persistence of dermatophytic infections.[3]

Among the fungal isolates recovered, *Candida* species were the predominant organisms, accounting for 62.2% of all culture-positive isolates. *Candida albicans* was the most frequently isolated species, followed by non-*albicans* *Candida* species. Similar findings have been reported by Narayan *et al.* and Kashyap *et al.*, who observed *Candida* species as important fungal pathogens isolated from clinical specimens.[2,6] However, interpretation of *Candida* isolates recovered from non-sterile specimens should be undertaken cautiously, as some isolates may represent colonization rather than true infection.

Dermatophytes, predominantly *Trichophyton* species, constituted the second most common group of fungal isolates. Dermatophytes remain important causes of superficial fungal infections and continue to contribute substantially to the burden of fungal diseases in India.[3] Their isolation from skin and nail specimens in the present study is consistent with observations reported by Kaur *et al.* and studies on dermatophytosis and onychomycosis.[3,7,8]

Mucorales and other filamentous fungi accounted for a smaller proportion of isolates. Although less frequently isolated, these fungi are clinically important because of their potential to cause invasive disease, particularly in susceptible hosts.[1,4] The recovery of

*Aspergillus*, *Fusarium*, *Bipolaris*, *Alternaria*, and other moulds in the present study demonstrates the diversity of fungal pathogens encountered in routine microbiology laboratories.

The findings of the present study are comparable with those reported in recent studies evaluating fungal isolates from tertiary care hospitals (Table 4). Similar to our findings, previous studies have reported *Candida* species as the predominant fungal isolates, followed by dermatophytes and other opportunistic fungi.[2,6] The increasing recovery of yeast isolates from clinical specimens may indicate changing epidemiological trends and the growing importance of opportunistic fungal pathogens in clinical practice.[1,4]

The present study provides an overview of fungal isolates encountered in a tertiary care laboratory setting. However, because of its retrospective design, detailed clinical information, treatment outcomes, and differentiation between colonization and true infection were not available for all patients. Therefore, the findings should primarily be interpreted as a laboratory-based profile of fungal isolates rather than a direct assessment of disease burden.

Despite these limitations, the study contributes valuable regional data regarding the spectrum of fungal isolates and highlights the importance of routine mycological investigations in the diagnosis of fungal infections.

## Conclusion

1. KOH mount can be used as an important screening test in rural hospitals or clinics for presumptive diagnosis of fungal infections; however, fungal culture remains confirmatory.
2. The clinical significance of yeast isolates recovered from non-sterile specimens should be interpreted cautiously, as differentiation between colonization and true infection was not possible in all cases.
3. Detailed clinical correlation could not be established because of the retrospective laboratory-based design of the study.
4. Fungal infections are emerging as a significant cause of morbidity.
5. Early diagnosis and treatment with appropriate antifungals play an important role in improving patient outcome.

### Limitations of the Study

1. **Retrospective Design:**The study relied on previously recorded data, limiting control over variables and completeness of clinical information.
2. **Lack of Antifungal Susceptibility Testing:**Antifungal resistance patterns were not analyzed, which limits therapeutic relevance.
3. **Single-Center Study:**Findings may not be generalizable to other regions or healthcare settings.
4. **Limited Clinical Correlation:**Detailed patient outcomes and risk factor analysis were not extensively evaluated.
5. **Possibility of Contamination:**Some isolates, particularly yeasts from skin and nail samples, may represent colonization or contamination rather than true infection.
6. **Absence of Molecular Methods:**Advanced diagnostic tools like PCR were not used, which may have improved detection

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**Figure1: Distribution of clinical specimens received for fungal investigation Figure 2: Distribution of culture-positive fungal isolates according to specimen type**

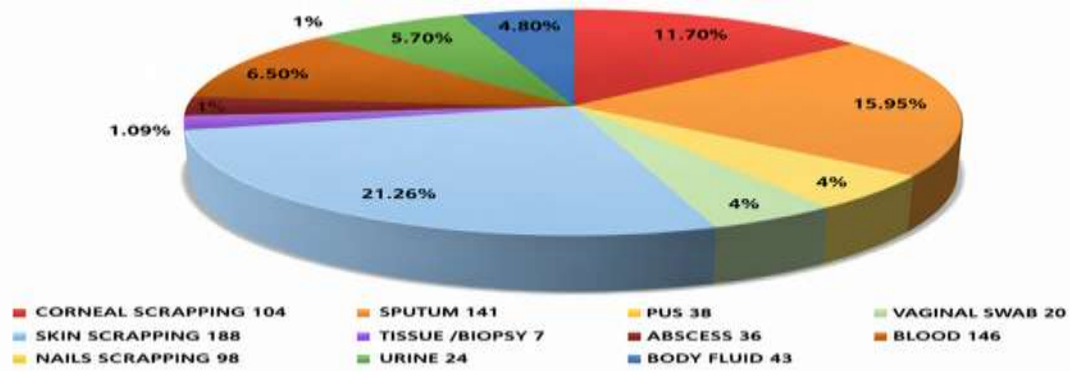


Figure 2: Distribution of culture-positive fungal isolates according to specimen type

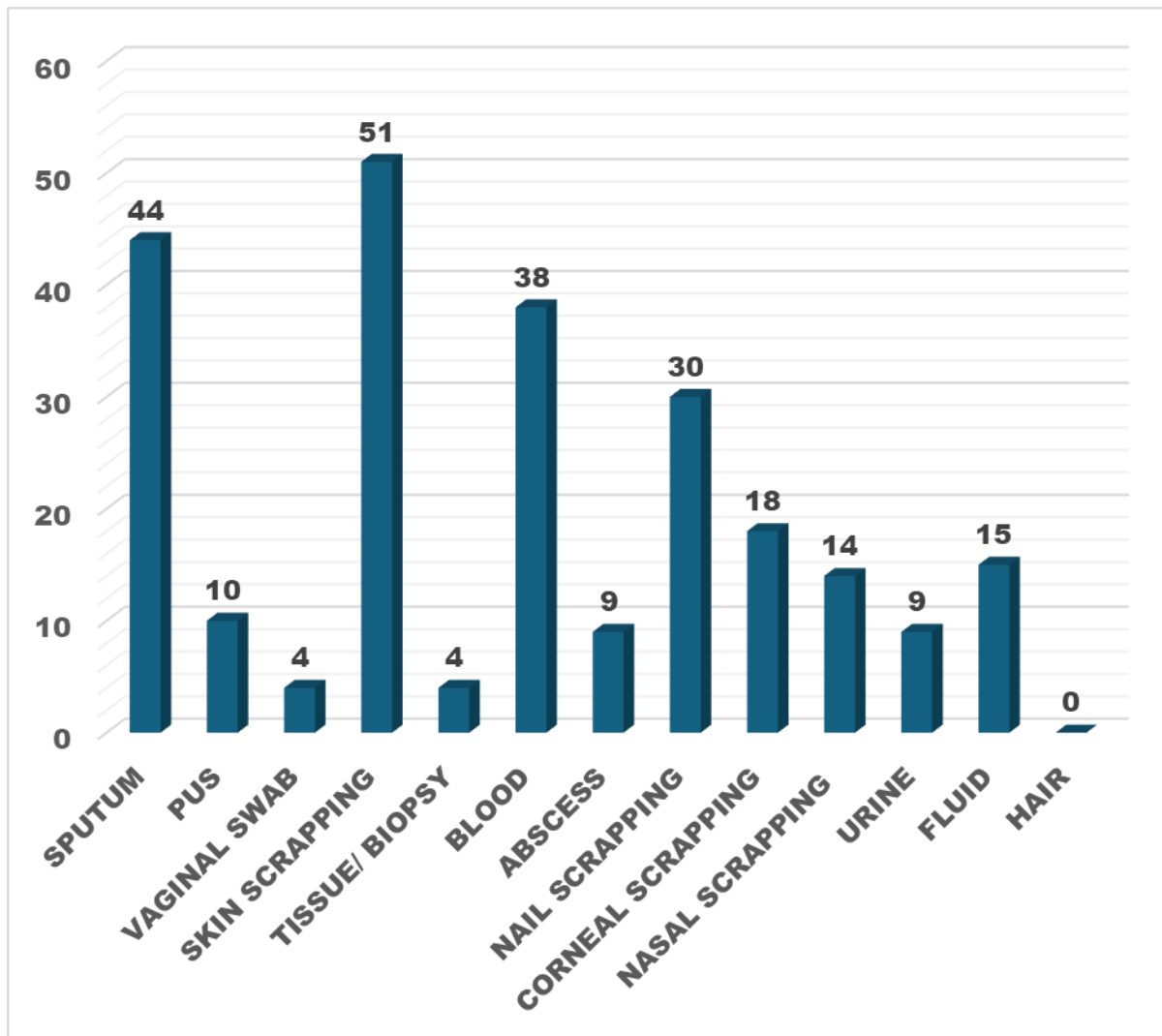


Table 1- Comparison of KOH mount and Culture of clinical sample

Microscopy KOH	Culture SDA	No. Of Patients(%)
Positive	Positive	113 (12.7%)
Positive	Negative	23(2.6%)
Negative	Positive	133(15.04%)
Negative	Negative	615(69.57%)
Total		884

**Table 2- Age- and gender-wise distribution of study specimens**

Age Group Years	Male	Female	Total
<12	111	88	199
12-40	254	194	448
>40	147	90	237
TOTAL	512	372	884

**Table 3 Species-wise distribution of fungal isolates recovered from culture-positive specimens**

Fungal Isolate	Number of Isolates	Percentage (%)
<i>Alternaria</i> spp.	3	1.2
<i>Aspergillus</i> spp.	11	4.5
<i>Bipolaris</i> spp.	4	1.6
<i>Candida albicans</i>	45	18.3
<i>Candida glabrata</i>	7	2.8
<i>Candida guilliermondii</i>	12	4.9
<i>Candida krusei</i>	4	1.6
Other <i>Candida</i> spp.*	85	34.5
<i>Cladophialophora carrionii</i>	2	0.8
<i>Cladosporium</i> spp.	2	0.8
<i>Fusarium</i> spp.	9	3.7

<i>Geotrichum capitatum</i>	1	0.4
<i>Microsporium canis</i>	1	0.4
<i>Rhizopus/Mucor</i> spp.	5	2
<i>Trichophyton</i> spp.	37	15
<b>Total</b>	<b>246</b>	<b>100</b>

**Table 4: Comparison of present study with recent studies [11-14]**

Study (Author, Year)	Study Type / Setting	Predominant Isolates	Key Findings
Present Study (Gupta et al.)	Tertiary care hospital, Western Maharashtra	<i>Candida</i> spp. (62.2%), <i>Trichophyton</i> spp.	<i>Candida</i> species predominated among fungal isolates recovered from clinical specimens
Bhadade et al., 2025	Tertiary care center, Central India	Non-albicans <i>Candida</i> spp. predominant	<i>Candida tropicalis</i> was the most common isolate; increasing importance of NAC species and susceptibility testing (PMC)
Aruna et al., 2025	Hospital-based cross-sectional study, India	Non-albicans <i>Candida</i> spp.	Significant prevalence of NAC species and emerging antifungal resistance (PMC)
Kumar et al., 2025	Retrospective study of clinical specimens	<i>Candida albicans</i> and NAC species	Demonstrated species distribution across multiple specimen types and shift toward NAC isolates (PubMed)
Borase et al., 2025	Invasive fungal infection study, tertiary hospital	<i>Candida</i> spp., including <i>Candida auris</i>	<i>Candida</i> was the predominant invasive fungal pathogen; emergence of <i>Candida auris</i> reported (Int. J. Med. Pharm. Res.)