

A STUDY ON FUNGAL PROFILE OF MYCOTIC INFECTIONS IN A TERTIARY CARE CENTRE IN MANIPUR, INDIA

Naorem Salinita Devi,¹ Chitra Yengkokpam,² Dayananda Ingudam,³ Urvashi Chongtham²

¹Department of Microbiology, Churachandpur Medical College, ²Department of Microbiology, ³Department of Community Medicine, Jawaharlal Nehru Institute of Medical Sciences, Imphal, Manipur, India

ABSTRACT

Fungal infections represent a growing public health challenge in tertiary care hospitals, particularly among immunocompromised patients. In resource limited settings, conventional diagnostic methods remain the mainstay for detection and epidemiological surveillance. The objective is to characterize the fungal profile of mycotic infections in a tertiary care centre in Imphal, Manipur, using conventional diagnostic techniques. A retrospective study was conducted over one year (January 2024–January 2025) in the Department of Microbiology, Jawaharlal Institute of Medical Sciences, Imphal. A total of 402 clinical specimens were processed by direct microscopy (KOH wet mount) and culture on Sabouraud's Dextrose Agar. Yeasts were identified by germ tube test and HiChrome *Candida* differential agar, while molds were characterized by LPCB staining. Among 402 samples, 175 (44.0%) pathogenic fungi were isolated. Culture positivity was highest among ICU patients (58.8%), followed by IPD (48.5%) and OPD (32.3%). Elderly patients (>70 years) demonstrated the highest positivity rate (57.6%). Non-albicans *Candida* spp. predominated (60.0%), with *Candida tropicalis* most frequent, particularly in urine and respiratory samples. *Candida albicans* accounted for 23.4% of isolates, while dermatophytes (*Trichophyton mentagrophytes* and *T. rubrum*) were common in nail clippings. Occasional molds (*Fusarium* spp., *Aspergillus fumigatus*) and rare isolates such as *Cryptococcus neoformans* were also recovered. KOH wet mount showed limited sensitivity (32.0%) but high specificity (89.9%) compared to culture. This study highlights the significant burden of fungal infections in Imphal, with a predominance of non-albicans *Candida* and higher culture positivity among elderly and ICU patients

KEYWORDS

Candida, fungal infection, immunocompromised patients, *Trichophyton*, onychomycosis, yeast

Received on: February 19, 2025

Accepted for publication: July 16, 2026

CORRESPONDING AUTHOR

Dr. Dayananda Ingudam
Assistant Professor,
Department of Community Medicine,
Jawaharlal Nehru Institute of Medical Sciences,
Porompat, Imphal East, Manipur, India
Email: chandi_yengkokpam@yahoo.co.in
Orcid No: <https://orcid.org/0009-0003-1251-3823>
DOI: <https://doi.org/10.3126/nmcj.v28i3.101220>

Cite this paper as: Devi NS, Yengkokpam C, Ingudam D, Chongtham U. A study on fungal profile of mycotic infections in a tertiary care centre in Manipur, India. *Nepal Med Coll J* 2026; 28: 202-9.

INTRODUCTION

Fungal infections have emerged as a significant public health concern, particularly in hospital settings where immunocompromised patients, invasive procedures, and prolonged antibiotic use create an ideal environment for opportunistic fungal pathogens to thrive. The spectrum of fungal diseases ranges from superficial infections such as dermatophytosis to life-threatening invasive mycoses, especially in patients with malignancies, organ transplants, or intensive care admissions.¹

Despite the rising incidence of fungal infections, especially in developing countries, the diagnostic infrastructure in many tertiary care hospitals remains constrained. Advanced techniques such as fungal PCR, MALDI-TOF mass spectrometry, and serological assays are often unavailable due to financial and logistical limitations. Consequently, conventional methods—namely direct microscopy (KOH wet mount), culture on Sabouraud Dextrose Agar, and morphological identification—continue to serve as the backbone of fungal diagnostics in resource-limited settings.²

While these traditional techniques are cost-effective and widely accessible, they are not without limitations. Direct microscopy offers rapid results but suffers from low sensitivity and specificity. Culture, though more definitive, is time-consuming and may fail to detect fastidious or non-viable organisms. Nevertheless, when applied judiciously, these methods can provide valuable epidemiological insights into the local fungal spectrum and guide empirical antifungal therapy.³

This study aims to characterize the spectrum of fungal pathogens isolated from various clinical specimens in a tertiary care hospital using conventional diagnostic methods. By analysing the distribution of fungal species across departments and sample types, we seek to highlight the utility and limitations of traditional diagnostics in a setting where advanced tools are not readily available.

MATERIALS AND METHODS

This retrospective study was carried out in the Department of Microbiology, Jawaharlal Nehru Institute of Medical Sciences, Imphal, Manipur, over a one-year period (January 2024 to January 2025). Clinical specimens submitted to the Mycology Section of Microbiology Department by clinicians for suspected fungal infections were included. After clinical correlations,

samples showing contaminant growth from environmental fungi such as *Aspergillus* spp. and *Penicillium* spp. were excluded.

Direct microscopy: All specimens were examined by direct microscopy using 20.0–40.0% potassium hydroxide (KOH) wet mounts to detect fungal elements.^{2,4} 20.0% KOH for 10 minutes was used for skin samples and 40% for 30 minutes – 2 hours was used for the nail samples. All respiratory samples (sputum, bronchoalveolar lavage, tracheal aspirates, pleural fluids etc) were subjected to Gram stain to detect yeast like budding cells with pseudohyphae.² For CSF (cerebrospinal fluid) samples direct microscopy using India Ink was performed for rapid detection of Cryptococcal meningitis.⁵

Culture: Each specimen was inoculated onto two slopes of Sabouraud's Dextrose Agar (SDA) and incubated at 25°C and 37°C for up to six weeks. Cultures were inspected twice weekly for fungal growth. Identification was initially based on colony morphology.²

Identification of molds: Molds were identified using slide culture and tease mount preparations stained with Lactophenol Cotton Blue (LPCB). Microscopic examination focused on hyphal characteristics and sporulation patterns.^{2,6}

Identification of yeasts: Yeast isolates were identified by colony morphology, Gram staining and urease test. *Candida* isolates were further speciated using germ tube test² and HiChrome *Candida* differential agar.⁷

Colony morphology of *Candida* spp. on HiCrome *Candida* differential agar are as follows -

- i. *Candida albicans*: light green coloured smooth colonies
- ii. *Candida tropicalis*: blue to metallic blue coloured raised colonies
- iii. *Candida glabrata*: cream to white smooth colonies
- iv. *Candida krusei*: purple fuzzy colonies

RESULTS

A total of 402 clinical specimens were included in the study. Female patients contributed the majority of samples (235; 58.0%), while male patients accounted for 167 (42.0%). The highest number of specimens were received from individuals aged 51–60 years (77; 19.0%), followed by those aged 41–50 years (70; 17.0%).

With respect to hospital source, most samples originated from inpatients (IPD) (196; 49.0%), followed by outpatients (OPD) (155; 39.0%) and

Table 1: Comparison of overall patient distribution and culture-positive cases according to sex and type of patients

Type of patient	Total patient (n=402)	Culture positive (n=175)	Positivity rate	Male positivity	Female positivity
IPD	196 (49.0%)	95 (54.0%)	(95/196) 48.5%	(38/94) 40.4%	(57/102) 55.9%
OPD	155 (39.0%)	50 (29.0%)	(50/155) 32.3%	(16/45) 35.6%	(34/110) 30.9%
ICU	51 (12.0%)	30 (17.0%)	(30/51) 58.8%	(15/28) 53.6%	(15/23) 65.2%

Table 2: A table showing KOH positive samples and different types of fungal isolates found across different types of samples included in the study

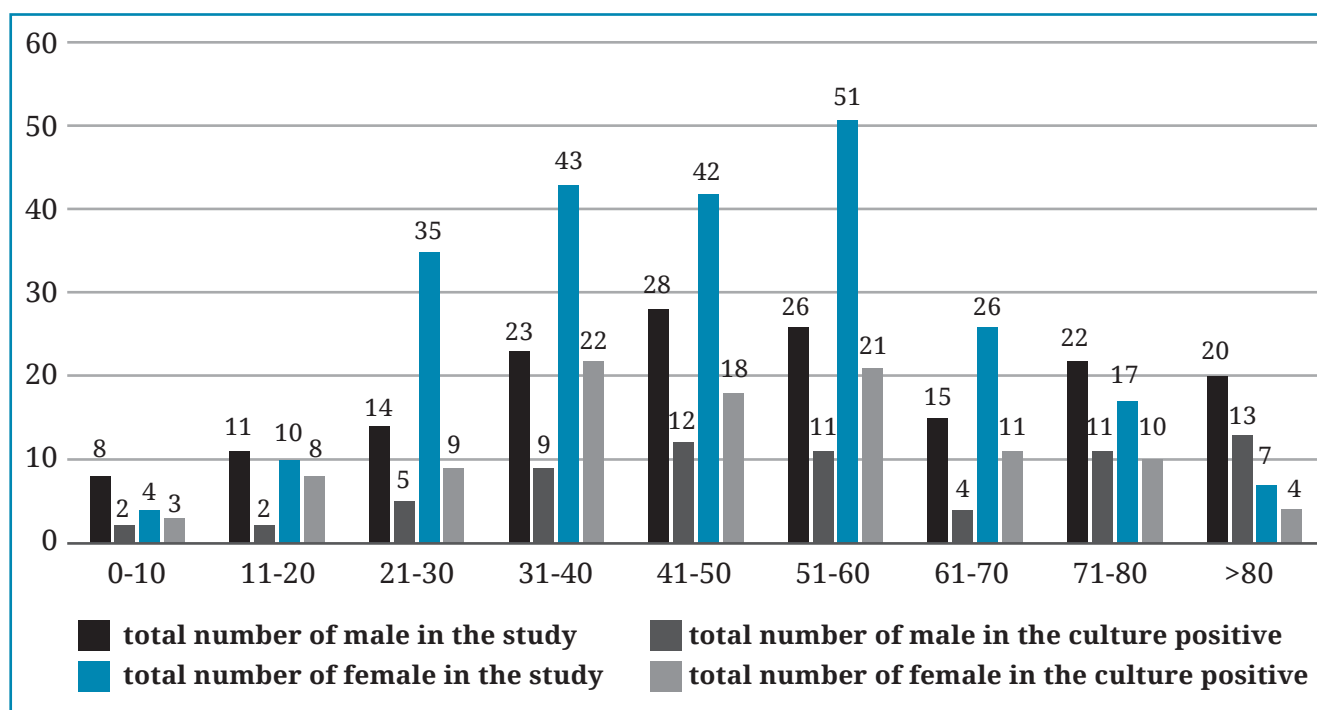
Type of samples	Total (in the study)	Total (koh positive)	Total (culture positive)	Non-candida albicans	Candida albicans	T. mentagrophyets	T. rubrum	Fusarium spp.	Scedosporium spp.	A. fumigatus	C. neoformans
Pus	20	6	6	4	2	0	0	0	0	0	0
Sputum	39	15	28	18	8	0	0	0	1	1	0
Bal	120	17	46	25	18	0	0	0	2	1	0
Corneal scraping	2	0	0	0	0	0	0	0	0	0	0
Skin scraping	9	3	2	0	0	1	1	0	0	0	0
Nail clipping	135	28	45	20	4	15	2	4	0	0	0
Tracheal aspirate	14	1	9	6	3	0	0	0	0	0	0
Gastric aspirate	1	1	1	1	0	0	0	0	0	0	0
Urine	42	7	33	27	6	0	0	0	0	0	0
Stool	1	0	1	1	0	0	0	0	0	0	0
Vaginal swab	3	1	1	1	0	0	0	0	0	0	0
Pleural fluid	6	0	0	0	0	0	0	0	0	0	0
Synovial fluid	1	0	0	0	0	0	0	0	0	0	0
Csf	2	0	1	0	0	0	0	0	0	0	1
Blood	7	0	2	2	0	0	0	0	0	0	0
Total	402	79	175	105	41	16	3	4	3	2	1

Table 3: A table showing the distributions of different types of non *Candida albicans* across different samples

Type of samples	C. tropicalis	C. krusei	C. glabrata	unspeciated non Candida spp.	Non-Candida albicans
Pus	1	1	2	0	4
Sputum	4	1	1	12	18
Bal	10	2	0	13	25
Nail clipping	11	0	0	9	20
Tracheal aspirate	1	0	0	5	6
Gastric aspirate	0	0	0	1	1
Urine	16	2	4	5	27
Stool	0	0	0	1	1
Vaginal swab	0	0	1	0	1
Blood	0	1	0	1	2
Total	43	7	8	47	105

Table 4: Comparison of the effectiveness of KOH wet mount and fungal culture

		Fungal culture		Total
		Positive	Negative	
KOH wet mount	Positive	56	23	79
	Negative	119	204	323
	Total	175	227	402

**Fig. 1:** Column chart showing distribution of age and sex in the overall study and culture positive cases

intensive care unit (ICU) patients (51; 12.0%). Within the IPD group, the medicine ward submitted the largest proportion (144/196), whereas in the OPD group, the Dermatology Department contributed the highest number of specimens (144/155) to the Mycology Section.

Among the various samples received, respiratory samples which include sputum (39), broncho-alveolar lavage (BAL) (120), tracheal aspirates (14) and pleural fluids (6) constitute the maximum samples (179, 45.0%), followed by nail clippings (135, 34.0%) and urine samples (42, 10.0%).

On direct microscopy using 20.0–40.0% KOH wet mounts, fungal elements were detected in 75 specimens (19%). Pathogenic fungi were isolated in culture from 175 specimens (44.0%) of the total samples.

A demographic overview of the distribution of age and sex among the overall study population and culture-positive cases is presented in the column chart (Fig. 1). The highest culture positivity was observed among females (106

cases), particularly in the 51–60-year age group (32/77 samples). In the elderly age groups (71–80 years and >80 years), a comparatively higher proportion of positive cultures was noted relative to the total number of samples received (38/66), indicating an increased culture positivity rate (57.6%) in these age categories.

The comparison of overall patient distribution and culture-positive cases according to sex and type of patients is shown in table 1. The highest proportion of culture positivity was observed in ICU patients (58.8%), followed by IPD (48.5%) and OPD (32.3%). Female patients demonstrated higher culture positivity rates compared to males across IPD and ICU settings (IPD: 55.9% vs. 40.4%; ICU: 65.2% vs. 53.6%). Notably, although ICU patients represented only 12.0% of the total cohort, they accounted for 17.0% of culture-positive cases, underscoring the diagnostic yield in critical care settings.

The maximum number of isolates obtained from fungal culture across all samples were non-*albicans* *Candida* spp. (105/175; 60.0%), followed by *C. albicans* (41/175;

Table 5: Comparative table showing different fungal study across different regions in India

Study (Location, Year, Reference)	Sample size	Culture positivity	Major specimens	Predominant isolates	Key notes
Imphal (present study) (2024–25)	402	44.0% (175/402)	BAL (120), nails (135), sputum (39), urine (42)	Non-albicans <i>Candida</i> (60%, esp. <i>C. tropicalis</i>), dermatophytes in nails	Female predominance (58.0%); ICU highest positivity (58.8%); KOH positivity 19%
Delhi (2022–24) (23)	100	100.0% (clinically confirmed)	Nails (27.0%), blood (17.0%), urine (20.0%), respiratory (19%)	<i>Candida</i> spp., superficial fungi	Slight male predominance; catheterization major risk factor (15.0%); majority without underlying disease (81.0%)
Uttarakhand (2019–20) (9)	900	16.0% (144/900)	Skin/nail (25.0%), sputum (21.0%), BAL (15.0%), corneal scrapings (12.0%)	<i>C. albicans</i> (40%), <i>Aspergillus</i> spp. (16.0%), <i>Fusarium</i> spp. (13.0%), <i>Zygomycetes</i> (10.0%)	Rare fungi (<i>Trichosporon dohaense</i> , <i>Cladophialophora bantiana</i> , <i>C. auris</i>); male predominance (65.0%), KOH positivity 42.0%, male predominance
Nagpur (2018–19) (15)	281	36.3% (102/281)	Sputum (43), urine (16), blood (11), BAL (10), corneal scrapings (8)	<i>Candida</i> spp. (70.6%: albicans 31.0%, NAC 39.0%), <i>Aspergillus</i> spp. (19.6%)	Male:female ratio 2.4:1; sputum most common positive specimen; diabetics/catheterized patients predisposed
North India (Himachal, 2016–17) (24)	212	50.4% (107/212)	Skin scrapings (154), pus/aspirates (31), sputum (7), nails (2)	Dermatophytes (<i>Trichophyton</i> spp. 69.5%), NAC in sputum	Male predominance (56.7%); age group 21–50 years most affected
South India (Tirupati, 2013–14) (25)	48,155 (all samples including bacterial culture)	1.2% (555/48,155)	Urine (21,815), catheter tips (1905), sputum (4598)	NAC (69.2%), <i>C. albicans</i> (28.3%), <i>Aspergillus</i> spp.	NAC showed high azole resistance (fluconazole 57.6%, voriconazole 56.8%); elderly males at higher risk
Western India (Pune, 2010–12) (26)	704	48.0% (336/704)	Sputum (409), body fluids/tissues (149), urine (50), corneal scrapings (25)	<i>C. albicans</i> (51.4%), NAC (20.2%), <i>Aspergillus</i> spp., <i>Zygomycetes</i>	High culture positivity; dimorphic fungi (<i>Sporothrix</i> , <i>Blastomyces</i>) also isolated; male predominance
Kerala (Thiruvananthapuram, 2013–14) (11)	366	22.1% (81/366)	Body fluids/pus/tissue (65), urine (8), sputum (2), nails (3)	NAC (32.0%), <i>A. flavus</i> (21.0%), <i>A. niger</i> (15.0%), <i>A. fumigatus</i> (12.0%)	Female predominance (54.5%); HIV-positive case with <i>C. neoformans</i>
Surat (2023) (16)	2767	7.9% (221/2767)	Sputum (43%), urine (31%), blood (12%)	NAC (48.0%, esp. <i>C. tropicalis</i>), <i>C. albicans</i> (33.0%), <i>C. krusei</i> , <i>C. glabrata</i> , <i>C. albicans</i>	ICU isolates showed higher azole resistance; male predominance (67.0%) KOH positivity 8.8%
Haryana (2011–2015) (8)	8450	23.7% (2006/8450)	Sputum 27.6%, skin 25.7%, Urine 15.4%, blood 10.3%, BAL 7.5%	40.6%> Non-albicans 25.2%, <i>Aspergillus</i> spp. and dematiaceous fungi isolated	Male predominance with Male:female=5:3, 15-60 years and >60 years are highly affected

23.4%) and *T. mentagrophytes* (16/175; 9.0%). A detailed distribution of isolates across different sample types is presented in Table 2. The highest proportional yield for culture positivity was observed in urine samples (33/42; 78.6%), followed by sputum (28/39; 71.8%). Bronchoalveolar lavage (BAL) (46/120; 38.3%) and nail clippings (45/135; 33.3%) also contributed to the overall culture positivity. In contrast, corneal scrapings, pleural fluid, and synovial fluid yielded no positive cultures.

Urine and sputum showed strikingly high culture positivity, with predominance of non-*albicans* *Candida*. BAL samples revealed mixed growth, with both *C. albicans* and non-*albicans* species, plus occasional molds (*Fusarium* spp., *Aspergillus* spp.). Nail clippings demonstrated dermatophytes (*T. mentagrophytes*, *T. rubrum*) alongside *Candida* spp., reflecting mixed etiologies in onychomycosis. Blood and CSF isolates were rare but clinically significant as *Candida* spp. and *C. neoformans* were isolated.

The *Candida* isolates (146) that were subjected to HiChrome *Candida* differential agar reveals 41 (28.0%) isolates as *C. albicans* which were further confirmed on Germ tube test. 43 (30%) isolates were identified as *C. tropicalis*, which were mainly isolated from urine and respiratory samples. 7 (5.0%) isolates were identified as *C. krusei* and 8 (5.0%) as *C. glabrata*. Rest of the *Candida* isolates (47, 32.0%) which are unreliable to identify using HiChrome agar were not speciated. Table 3 shows the distributions of different types of non *C. albicans* across different samples.

A 2×2 contingency table 4, comparing KOH wet mount with fungal culture demonstrated a sensitivity of 32.0%, specificity of 89.9%, positive predictive value of 70.9%, and negative predictive value of 63.2%. The chi-square statistic was 30.0 (df = 1, $p < 0.0001$), confirming a statistically significant association between KOH wet mount and fungal culture, although the sensitivity remained limited.

DISCUSSION

The present study provides a comprehensive overview of the epidemiology and fungal profile of mycotic infections in a tertiary care centre in Imphal, India. Out of 402 clinical specimens, pathogenic fungi were isolated in 175 (44.0%), underscoring the significant burden of fungal infections in hospitalized and outpatient populations.

Age and sex distribution: Culture positivity was notably higher among elderly patients (>70

years), with a rate of 57.6%. Similar findings were reported from tertiary centres in Haryana and Uttarakhand, where advanced age was associated with increased susceptibility to fungal infections due to comorbidities and immunosenescence.^{8,9} Female patients demonstrated higher culture positivity across IPD and ICU settings, a pattern also observed in studies from Manipur,¹⁰ Kerala¹¹ and Northeast India,¹² possibly reflecting gender-specific healthcare-seeking behaviour in these regions.

Hospital source and clinical setting: The highest proportion of culture positivity was observed among ICU patients (58.8%), followed by IPD (48.5%) and OPD (32.3%). This emphasizes the vulnerability of critically ill patients, particularly those exposed to invasive devices and broad-spectrum antibiotics, which predispose to opportunistic fungal infections.¹³ Similar ICU-associated trends have been reported in tertiary hospitals in West Uttar Pradesh,¹⁴ highlighting the need for vigilant surveillance and early antifungal intervention in critical care units.

Spectrum of fungal isolate: Non-*albicans* *Candida* spp. (60%) predominated over *C. albicans* (23.4%), consistent with the shifting epidemiology of candidiasis reported across India.¹⁵ *C. tropicalis* was the most frequent non-*albicans* isolate, particularly from urine and respiratory samples, similar findings were seen from Surat and Nagpur.^{16,17} The emergence of *C. krusei* and *C. glabrata*, though less frequent, is clinically significant given their intrinsic or acquired resistance to azoles.¹⁸ Dermatophytes, especially *T. mentagrophytes*, were common in nail clippings, reflecting the mixed etiology of onychomycosis, as previously documented in Imphal¹² and Northeast India.¹⁹ Occasional isolation of molds such as *Fusarium* spp. and *A. fumigatus* from respiratory samples underscores their role as opportunistic pathogens in immunocompromised hosts.² Rare but clinically important isolates such as *C. neoformans* from CSF highlight the diagnostic relevance of conventional culture in life-threatening infections.²⁰

Diagnostic utility of conventional methods: Direct microscopy using KOH wet mount demonstrated limited sensitivity (32.0%) but high specificity (89.9%). This diagnostic profile mirrors earlier reports from tertiary centres in India²¹ and Pakistan,²² where KOH mount served as a rapid screening tool but required culture confirmation for definitive diagnosis. The statistically significant association between KOH and culture ($\chi^2 = 30.0$, $p < 0.0001$) reinforces

its utility as a preliminary diagnostic method, particularly in resource-constrained settings. The samples which shows positive for fungal elements in KOH wet mount but shows no growth in fungal culture may be accounted by the non-viability of the fungi due to inadequate or improper sampling, prior antifungal treatment, subjective error or difficult to culture species which require specialized media for their growth. Culture remains indispensable for species identification and epidemiological surveillance, despite its longer turnaround time.² But for early initiation of antifungal therapy and to reduce the mortality rate, highly specific microscopic KOH examination can be utilized in resource limited setup.

Comparative insight and regional variation: A comparative table of fungal studies from different regions of India and their comparative insight are given in Table 5.

This retrospective study highlights the epidemiological burden and fungal profile using conventional methods in detecting mycotic infections at a tertiary care centre in Imphal city of Manipur, India. Out of 402 clinical specimens, culture positivity was observed in 44.0%, with a predominance of non albicans *Candida* spp., particularly *C. tropicalis*, followed by *C. albicans* and dermatophytes. Female patients and elderly age groups demonstrated higher culture positivity, while ICU patients yielded the highest proportion of positive isolates, underscoring the vulnerability of critically ill populations.

Direct microscopy using KOH wet mount, though rapid and inexpensive, showed limited

sensitivity but high specificity, reaffirming its role as a preliminary screening tool for early initiation of antifungal therapy but also requires culture confirmation. Culture remains indispensable for species identification and epidemiological surveillance, despite its longer turnaround time.

The findings emphasize the need for continuous surveillance of fungal pathogens, especially non-albicans *Candida*, and highlight the importance of strengthening diagnostic infrastructure in resource limited settings. Integration of conventional methods with advanced technologies such as MALDI TOF and PCR, alongside antifungal stewardship, will be crucial in improving patient outcomes and guiding effective management strategies in tertiary care hospitals.

LIMITATION OF THE STUDY: Not all non-albicans *Candida* can be speciated, as this study utilizes only Hichrome *Candida* differential agar for speciation of *Candida* which can only reliably detect few of the species.

ACKNOWLEDGEMENT

We express our sincere gratitude to the Departments of Microbiology at Jawaharlal Nehru Institute of Medical Sciences, Porompat, Manipur for providing necessary facilities and support that enable the successful completion of this research.

Conflict of interest: None

Source of research fund: None

REFERENCES

1. Chakrabarti A, Chatterjee SS, Shivaprakash MR. Overview of opportunistic fungal infections in India. *Nihon Ishinkin Gakkai Zasshi* 2008; 49: 165-72.
2. Chander J. Textbook of Medical Mycology 2018; (4th ed.). Mehta Publishers.
3. Kothavade RJ, Monteiro DC, Rathi KR, Chowdhary AS. *Candida tropicalis*: its prevalence, pathogenicity and antifungal resistance. *FEMS Yeast Res* 2010; 10: 933-41.
4. Knoll MA, Steixner S, Lass-Flörl C. How to use direct microscopy for diagnosing fungal infections. *Clin Microbiol Infect* 2023; 29: 1031-8. DOI: 10.1016/j.cmi.2023.05.012.
5. Siagian FE. Paint it black: staining of yeast *Cryptococcus neoformans* with India ink. *Int'l J Pathogen Res* 2024; 13: 56-64.
6. Chakrabarti A, Rudramurthy SM, Kaur H *et al*. Standard operating procedure for fungal identification and detection of antifungal resistance. ICMR, New Delhi; 2nd edition 2019: 3-8.
7. Mehta R and Wyawahare AS. Evaluation of Hichrome *Candida* differential agar for species identification of *Candida* isolates from various clinical samples. *Int J Cont Med Res* 2016; 3: 1219-22.
8. Alim A, Goel N, Chaudhary U. Spectrum of fungal infections at a tertiary care hospital in Haryana, India. *Int'l J Res Med Sci* 2018; 6: 1398-401
9. Rohilla R, Mohanty A, Meena S *et al*. Epidemiology of mycotic infections: experience from a tertiary care center of Uttarakhand, India. *Trop J Pathol Microbiol* 2021; 7: 93-8.

10. Chongtham U, Athokpam DC, Singh R. Isolation, identification and antifungal susceptibility testing of *Candida* species: a cross-sectional study from Manipur, India. *J Clin Diagn Res* 2022; 16: DC01–DC05.
11. Bhamra S, Rajahamsan J, Theodore RJ. Prevalence of fungal infections in a tertiary care centre: a retrospective study. *J Acad Clin Microbiol* 2015; 17: 81-3.
12. Chongtham U, Preeti G, Singh HL. Mycological pattern of dermatomycoses in a tertiary care centre in North East India. *J Evol Med Dent Sci* 2018; 7: 1373-5.
13. Patil N and Naik D. To study the prevalence of colonization and infection by *Candida* species in intensive care units at a tertiary care hospital, India. *Int J Sci Appl Tech* 2025; 13: 45-51.
14. Kalita K, Sarwat T, Mahajan S, Kakru DK, Kalita B. Incidence of fungal infections in intensive care units in a tertiary care centre, West Uttar Pradesh. *Int'l J Acad Med Pharm* 2024; 6: 425-30.
15. Kalbhor P, Raut SS, Chavan S, Khadse RK. Mycological profile of fungal infections from various clinical samples in a tertiary care hospital. *Paripex Indian J Res* 2019; 8: 38-40.
16. Sarkar K and Mullan S. Fungal profile of clinical specimens from a tertiary care hospital – a retrospective study. *Glob J Res Anal* 2024; 13: 40-2. DOI: 10.36106/gjra
17. Nirmal K, Nirmal S, Chawla R, Baveja CP. Evaluation of HiCrome *Candida* differential agar for identification of *Candida* isolated from various clinical specimens. *Int'l J Curr Microbiol App Sci* 2021; 10: 341-50.
18. Pfaller MA and Diekema DJ. Epidemiology of invasive candidiasis: a persistent public health problem. *Clin Microbiol Rev* 2007; 20: 133–63.
19. Pukhrambam PD, Raj B, Devi KR. Trend of onychomycosis in RIMS Hospital, Imphal. *Int J Curr Res* 2019; 11: 8568-71.
20. Perfect JR and Casadevall A. Cryptococcosis. *Infect Dis Clin North Am* 2002; 16: 837-74.
21. Manjyot G, Nidhi S, Bhattar P, Nadkarni N, Patil S. Comparative evaluation of potassium hydroxide mount, fungal culture, and histopathology of nail clipping with periodic acid–schiff stain in the diagnosis of onychomycosis. *Indian J Dermatopathol Diagn Dermatol* 2021; 8: 6-12. DOI: 10.4103/ijdpdd.ijdpdd_94_20
22. Agha H, Noreen F, Raza Naeem, Malik NA. Comparison of yields of KOH mount and PAS staining of nail clippings for hyphae in cases of onychomycosis. *Pak Armed Forces Med J* 2018; 68: 80–4
23. Sharma A, Kaur R, Rawat D. Fungal disease profile in a tertiary care hospital in New Delhi. *Int'l J Life Sci Biotechnol Pharma Res* 2025; 14: 63-8. DOI: 10.69605/ijlbpr_14.4.2025.12.
24. Chauhan M, Mahajan S, Abrol A, Abrol R. Spectrum of fungal isolates of clinical specimens from a tertiary care hospital of North India. *Int J Sci Res* 2018; 7: 1199-201. DOI: 10.21275/ART20197125
25. Jayaprada R, Nagaraja M, Sumanth Kumar GLS, Venkataramana B, Kalawat U. Common fungal isolates from routine clinical specimens - A two-year study from a tertiary care hospital in South India. *J Clin Sci Res* 2017; 6: 2-9. DOI: <http://dx.doi.org/10.15380/2277-5706.JCSR.15.015>.
26. Gandham NR. The spectrum and aetiology of mycotic infections from a tertiary care hospital from Western part of India. *J Clin Diagn Res* 2013; 7: 2157-9. DOI: 10.7860/JCDR/2013/5791.3457