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Original Research Article

A Study on Isolation and Identification of Dermatophytes Among Clinically Suspected Cases in A Tertiary Care Center, Patna

Sushma Kumari[1], Khushboo Kumari[2], Vijay Kumar[3], Pratulya Nandan[4]

[1]Tutor, Department of Microbiology, Patna medical College and Hospital, Patna, Bihar, India
[2]Tutor, Department of Microbiology, Patna medical College and Hospital, Patna, Bihar, India
[3]Professor and HOD, Department of Microbiology, Patna medical College and Hospital, Patna, Bihar, India
[4]Professor, Department of Microbiology, Patna medical College and Hospital, Patna, Bihar, India

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Corresponding Author: Dr. Khushboo Kumari
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Abstract:

Background: Dermatophytosis is a common superficial fungal infection affecting keratinized tissues and poses a significant public health problem in tropical countries like India. Accurate laboratory diagnosis is essential due to varied clinical presentations and overlapping features with other dermatoses.

Aim: To isolate and identify dermatophytes among clinically suspected cases of dermatophytosis in a tertiary care teaching hospital.

Methodology: A descriptive cross-sectional study was conducted over 7 months involving 96 clinically suspected cases. Skin, nail, and hair samples were subjected to direct microscopic examination using KOH mount and fungal culture. Isolates were identified based on standard macroscopic and microscopic characteristics.

Results: Tinea corporis (50%) was the most common clinical presentation, followed by tinea cruris (22.9%). Overall culture positivity was 68.8%, while KOH positivity was 64.6%. Hair samples showed 100% culture positivity. *Trichophyton rubrum* (56.1%) was the predominant species, followed by *T. mentagrophytes* (40.9%).

Conclusion: Dermatophytosis was predominantly caused by *Trichophyton* species, with glabrous skin involvement being most common. Combined use of KOH mount and culture is essential for accurate diagnosis and effective management.

Keywords: Dermatophytosis, Dermatophytes, KOH mount, Fungal culture, *Trichophyton rubrum,* Tertiary care hospital.

Introduction

Dermatophytosis is one of the most prevalent superficial fungal infections affecting humans globally. It affects keratinized tissues of the skin, hair, and nails and affects all age groups in both developed and developing countries [1,2]. Over the past few decades, a sharp rise has been observed in the incidence of dermatophytic infections, mainly due to extensive use of immunosuppressive drugs, spreading immunocompromising diseases, and changing lifestyles. Tropical and subtropical countries, like India, have a high disease burden due to its hot and humid climatic conditions, highly favorable for the growth and spread of fungi [3]. Thus, dermatophytosis or ringworm infection remains a major health concern and common morbidity in these areas.

Dermatophytes are a group of keratinophilic fungi that have the distinctive ability to utilize keratin as a nutrient source [4]. This property enables them to colonize and invade keratinized tissues such as the stratum corneum of the skin, hair shafts, and nails, producing a variety of clinical manifestations associated collectively with dermatophytosis. Based on the site of involvement, dermatophytic infections present themselves in forms like tinea corporis, tinea cruris, tinea pedis, tinea capitis, and tinea unguium. Although these infections take a benign course and are superficial in nature, they are usually associated with considerable discomfort, pruritus, cosmetic concern, and when inadequately treated, may become chronic or recur frequently [5]. Their chronic nature also makes them highly contagious and spreads easily in communities, especially in areas where people live in overcrowded conditions with poor hygiene practices [6].

The integrity of the host immune response is an important factor in determining the severity and extent of dermatophytic infections. Depression of cellular immunity from various causes, such as malignancies, prolonged administration of

corticosteroids or other immunosuppressive drugs, and endocrine disorders including Cushing's disease, may predispose individuals to atypical, extensive, and invasive dermatophyte infections [7]. During such states of immunocompromise, infection may present with unusual clinical features, become generalized, or fail to respond to conventional antifungal therapy. Early identification and timely intervention are hence very important, as once the infection has taken hold, the affected individual stands the risk of becoming a chronic carrier, thereby increasing the chances of recurrence and further spread of infection to close contacts.

Accurate clinical diagnosis of dermatophytosis is often problematic due to the great variability and overlapping in the clinical presentation of tinea infections [8]. Many lesions may appear similar to other dermatological diseases, which lead to misdiagnosis and inappropriate treatment. Therefore, clinical suspicion alone is not sufficient, and confirmation from the laboratory is required for definite diagnosis. Laboratory diagnosis is crucial not only in the confirmation of dermatophytosis but also in the identification of the specific etiological agent involved. Direct microscopic examination with KOH preparation offers rapid preliminary evidence of fungal elements, but it does not permit the identification of species. Therefore, fungal culture is still an indispensable adjunct to direct microscopy for the exact identification of dermatophytes.

Thus, culture-based identification is particularly important in the management of nail and skin infections, since these conditions may also be caused by non-dermatophytic filamentous fungi. Such organisms are increasingly recognized as significant pathogens, often resistant to the usual antifungal regimens used in dermatophytic infections. Failure to identify non-dermatophytic fungi can lead to therapeutic failure and chronic infection. Therefore, proper culture-based isolation and identification of the involved organism is an essential tool in guiding appropriate antifungal therapy toward effecting patients [9].

Accurate and rapid identification of the dermatophyte species has significant epidemiological and public health implications. Knowledge of species distribution, host preference, and ecological patterns helps to understand the transmission dynamics of dermatophytosis and to implement appropriate infection control measures. Dermatophyte species differ in geographic distribution and reservoir and shifts in these may reflect changes in environmental conditions, human habits, and host susceptibility. Continuous surveillance and identification at the level of species are, therefore, of primary importance for monitoring the trend in dermatophytic infection within a population.

The diversity of clinical manifestations in dermatophytosis often leads to late diagnosis and poor compliance in treatment and follow-up. Insufficient treatment and early cessation of therapy lead to chronic infection, recurrence, and continued transmission in the community. Such challenges have rejuvenated interest in the improvement of diagnostic techniques for the rapid and accurate identification of dermatophyte species. Early diagnosis facilitates not only the timely institution of appropriate therapy but also helps reduce disease burden and prevent complications associated with chronic or recurrent infections.

Patients from all walks of life with a suspicion of dermatophytic infection are presented to the tertiary care teaching hospital. It is in such a setting that one gets to study the spectrum of dermatophyte species, their clinical correlation, and laboratory characteristics. Systematic isolation and identification of dermatophytes are indispensable to develop a proper concept regarding the local epidemiology of dermatophytosis, which is crucial in the management of the disease and for formulating relevant preventive strategies. Thus, this study was undertaken to isolate and identify dermatophytes in clinically suspected cases presenting to the tertiary care teaching hospital to aid in better diagnosis, patient care, and epidemiology of dermatophytic infections.

Methodology

Study Design: This was a hospital-based descriptive cross-sectional study conducted to isolate and identify dermatophytes from clinically suspected cases of dermatophytosis.

Study Area: The study was carried out in the Department of Microbiology, in collaboration with the Department of Dermatology, Patna Medical College and Hospital (PMCH), Patna, Bihar, India

Study Duration: The study was conducted over a period of 7 months from March 2025 to Sept 2025.

Sample Size: A total of 96 clinically suspected cases of dermatophytosis were included in the study.

Study Population: The study population comprised patients of all age groups and both sexes attending the Dermatology Outpatient Department (OPD) of Patna Medical College and Hospital with clinical features suggestive of dermatophytosis, such as tinea corporis, tinea cruris, tinea capitis, tinea pedis, tinea unguium, and related clinical variants.

Inclusion Criteria

- Patients with clinical suspicion of dermatophytosis
- Patients willing to give informed consent
- Patients of all age groups and both sexes
- Newly diagnosed cases not on antifungal treatment or with adequate washout period

Exclusion Criteria

- Patients already receiving systemic or topical antifungal therapy at the time of sample collection
- Patients unwilling to participate in the study
- Inadequate or improperly collected samples
- Cases with non-fungal dermatological conditions

Data Collection: After clinical evaluation by the dermatologist, patients with suspected dermatophytosis were referred to the Department of Microbiology, Patna Medical College and Hospital, for laboratory confirmation. Relevant demographic and clinical details, including age, sex, clinical type of lesion, and site of involvement, were recorded in a structured proforma. Depending on the type and site of the lesion, appropriate specimens such as skin scrapings, nail scrapings or clippings, and infected hair stubs were collected under aseptic precautions. Skin scrapings were obtained from the active margins of lesions after cleaning the area with 70% alcohol, while nail samples were collected from the diseased portion of the nail. Hair specimens were collected by plucking infected hair stubs with sterile forceps. All samples were promptly transported to the mycology laboratory for processing. Each specimen was subjected to direct microscopic examination using potassium hydroxide (KOH) mount and cultured on appropriate media irrespective of KOH findings. The culture plates were incubated and periodically examined for fungal growth, and isolates were identified based on standard macroscopic and microscopic characteristics along with confirmatory tests.

Statistical Analysis: The collected data were entered into Microsoft Excel and analyzed using appropriate statistical software. Descriptive statistical methods were employed to summarize demographic variables, clinical presentations, and laboratory findings. Results were expressed as frequencies and percentages to assess the distribution of dermatophyte species, KOH positivity, and culture positivity among the study population. The findings were presented in the form of tables and graphical representations wherever appropriate to facilitate interpretation and comparison."

Result

Table 1 depicts the incidence of various clinical types of dermatophytosis among 96 patients. Tinea corporis was the most common presentation, accounting for 48 cases (50%), followed by tinea cruris in 22 cases (22.9%). Onychomycosis was observed in 10 patients (10.4%), while tinea pedis constituted 8 cases (8.3%). Less frequent clinical types included tinea manuum with 4 cases (4.2%), and both tinea barbae and tinea capitis with 2 cases each (2.1%). Overall, superficial dermatophytosis predominantly involved tinea corporis and tinea cruris in this study population.

Table 1: Incidence of Various Clinical Types of Dermatophytosis (N = 96)

Clinical type	Number of cases	Percentage (%)
Tinea corporis	48	50
Tinea cruris	22	22.9
Onychomycosis	10	10.4
Tinea pedis	8	8.3
Tinea manuum	4	4.2
Tinea barbae	2	2.1
Tinea capitis	2	2.1
Total	**96**	**100**

Table 2 shows the comparison between direct microscopic examination (KOH mount) and fungal culture results. Out of 96 specimens, 62 (64.6%) were KOH positive and 34 (35.4%) were KOH negative. Culture positivity was observed in 66 cases, of which 52 were also KOH positive, indicating good concordance between KOH examination and culture. However, 14 specimens that were KOH negative turned out to be culture positive, highlighting the added diagnostic value of culture. Conversely, 10 KOH-positive specimens were culture negative. Overall, the findings suggest that while KOH mount is a useful rapid screening tool, fungal culture remains essential for definitive diagnosis.

Table 2: Showing Results of Direct Examination (KOH) and Culture

	KOH +ve	KOH –ve	Total
Culture positive	52	14	66
Culture negative	10	20	30
Total	**62**	**34**	**96**

Table 3 depicts the distribution of specimen types and their culture positivity rates. Of the 96 specimens collected, skin scrapings constituted the majority (78 cases), with 52 yielding positive cultures, giving a culture positivity rate of 66.7%. Nail scrapings or clippings accounted for 10 cases, of which 6 were culture positive (60%). All hair stub specimens (8 cases) were culture positive, demonstrating the highest positivity rate at 100%. Overall, 66 out of 96 specimens were culture positive, resulting in an overall culture positivity rate of 68.8%, indicating that hair stubs had the highest diagnostic yield compared to skin and nail specimens.

Table 3: Showing Type of Specimen and Aetiological Agent Isolated

Specimen type	No. of cases	Culture positive	Percentage (%)
Skin scrapings	78	52	66.7
Nail scrapings / clippings	10	6	60
Hair stubs	8	8	100
Total	**96**	**66**	**68.8**

Table 4 shows the relationship between clinical types of dermatophytosis and the aetiological agents isolated. Tinea corporis was the most common clinical presentation (48/66 cases), predominantly caused by Trichophyton rubrum (18 cases) and T. mentagrophytes (16 cases), followed by Epidermophyton floccosum (6 cases) and Microsporum gypseum (4 cases). Tinea cruris (22 cases) was mainly associated with T. rubrum (8 cases), T. mentagrophytes (6 cases), and E. floccosum (4 cases). Tinea pedis (8 cases) was chiefly due to T. rubrum (4 cases), with smaller contributions from T. mentagrophytes, E. floccosum, and M. gypseum (one case each). Less frequent clinical forms included tinea manuum (4 cases), tinea barbae (2 cases), and tinea capitis (2 cases), with tinea capitis exclusively caused by Microsporum audouinii. Onychomycosis accounted for 10 cases, most commonly due to T. rubrum (4 cases). Overall, T. rubrum and T. mentagrophytes were the leading causative agents across most clinical types.

Table 4: Showing Clinical Type in Relation to Aetiological Agents

Aetiological agent	Tinea corporis	Tinea cruris	Tinea pedis	Tinea manuum	Tinea barbae	Tinea capitis	Onychomycosis	Total
T. rubrum	18	8	4	2	1	0	4	37
T. mentagrophytes	16	6	2	1	1	0	1	27
E. floccosum	6	4	1	0	0	0	0	11
M. gypseum	4	0	1	0	0	0	0	5
M. audouinii	0	0	0	0	0	2	0	2
T. tonsurans	2	0	0	0	0	0	0	2
T. violaceum	2	0	0	0	0	0	1	3
Total	**48**	**22**	**8**	**4**	**2**	**2**	**10**	**66**

Table 5 depicts the percentage distribution of dermatophyte species isolated among 66 cases. Trichophyton rubrum was the predominant species, accounting for 37 isolates (56.1%), followed by Trichophyton mentagrophytes with 27 isolates (40.9%). Other dermatophytes were less frequently isolated, including Epidermophyton floccosum in 11 cases (16.7%) and Microsporum gypseum in 5 cases (7.6%). Trichophyton violaceum was identified in 3 isolates (4.5%), while Microsporum audouinii and Trichophyton tonsurans were the least common, each isolated in 2 cases (3%). Overall, Trichophyton species constituted the majority of dermatophyte isolates in this study.

Table 5: Percentage Distribution of Dermatophyte Species Isolated (n = 66)

Species	Number of isolates	Percentage (%)
Trichophyton rubrum	37	56.1
Trichophyton mentagrophytes	27	40.9
Epidermophyton floccosum	11	16.7
Microsporum gypseum	5	7.6
Microsporum audouinii	2	3
Trichophyton tonsurans	2	3
Trichophyton violaceum	3	4.5

Discussion

Clinical manifestations of infections involving glabrous skin predominated in the present study, with tinea corporis (50%) being the most common presentation, followed by tinea cruris (22.9%). This pattern is in concurrence with several Indian studies where tinea corporis and tinea cruris have been consistently reported as the leading clinical types of dermatophytosis. Mishra et al. reported tinea corporis as the most frequent presentation in their clinic mycological profile and attributed it to greater exposure of the body surface and favorable environmental conditions like humidity and sweating [10]. Similarly, Bindu and Pavithran observed a predominance of tinea corporis and tinea cruris in their study from Calicut and associated it with tropical climate and lifestyle factors [11]. However, Veer et al reported onychomycosis to be a more common presentation in their study population, probably reflecting the difference in occupational exposure and healthcare-seeking behaviour [12]. The relatively lower proportion of onychomycosis (10.4%) and tinea pedis (8.3%) in the present study may be because of underreporting or delayed presentation as these are often perceived to be cosmetic rather than pathological problems."

Laboratory diagnosis in the present study again reinforces that both direct microscopy and culture are employed in order to arrive at an accurate diagnosis. In all, 64.6% cases were KOH positive while culture positivity was slightly higher at 68.8%. Similar figures have been reported by Singh and Beena, who comment that reliance on a single modality for diagnosis may result in underdiagnosis as some cases are positive only on microscopy while others yield growth only on culture [13]. The fact that as many as 14 cases were culture positive but KOH negative could be attributed to scanty fungal elements or sampling errors during direct microscopy. Conversely, KOH-positive but culture-negative results, seen in 10 cases, may be attributed to non-viable fungal elements or prior antifungal therapy, as was also seen by Sen and Rasul (2006) [14]. Again, these findings reinforce that culture and KOH examination are complementary, as indeed stated in standard mycology texts also (Chander, 2009) [15].

In the analysis of specimen types, hair stubs revealed a 100% culture positivity rate, followed by skin scrapings (66.7%) and nail samples (60%). The high yield from hair specimens may be due to the deeper invasion of dermatophytes into hair shafts, making fungal elements more viable and hence easier to culture. Similarly, Emmons et al. reported a high positivity rate of culture from hair samples in cases of tinea capitis [16]. Relatively lower positivity in the case of nail samples is in accordance with observations by several workers stating that the isolation of dermatophytes from nails is often difficult because of slow growth, secondary bacterial contamination, and frequent non-dermatophyte moulds [17]. However, overall culture positivity of 68.8% found in the present study is comparable to other studies from India as about 60% to 75% positivity rates have been reported earlier [14,18] (Sen & Rasul, 2006; Venkatesan et al., 2007).

Regarding the etiological agents, Trichophyton rubrum predominated as the most common isolate, 56.1%, followed by Trichophyton mentagrophytes, 40.9%. These results are in concert with many reports from India that describe T. rubrum as the most frequently encountered dermatophyte species causing dermatophytosis. Venkatesan et al. recorded T. rubrum as the major isolate in Chennai, suggesting its preponderance could be due to its ability to cause chronic, recurrent infections, and therefore was well adapted to human hosts [18]. Karmakar et al. also reported T. rubrum as the most frequent species in Western Rajasthan, though the climate is completely different, indicating its distribution throughout the region and showing its dominance [19]. However, there are some regional variations; some studies from different regions have reported T. mentagrophytes as the most predominant species, which could possibly be due to zoonotic infection and rural exposure conditions (Fathi & al-Samarai, 2000) [20].

Epidermophyton floccosum constituted 16.7% of isolates in the current study; this species was commonly associated with tinea corporis and tinea cruris. This percentage is relatively higher than that found by Bindu and Pavithran, who reported a low isolation rate for E. floccosum [11]. The difference could be due to better maintenance of personal hygiene, different style of dress, and epidemiological situation in the region. Microsporum gypseum was isolated in 7.6% of cases; the common sources were tinea corporis and tinea pedis, which agrees with the soil contact nature of the dermatophyte, as illustrated by Rippon (1988) [21].

The isolation of Microsporum audouinii in cases of tinea capitis is significant, considering that this species has now become relatively rare in recent Indian studies. Though not isolated by Bindu and Pavithran or Venkatesan et al., its isolation in the current study agrees with earlier reports by Karmakar et al., with the indication that the epidemiological pattern in older studies may still exist in some population groups (Karmakar et al., 1995) [19]. The occasional isolation of Trichophyton tonsurans and Trichophyton violaceum suggests that dermatophytosis still has a wide etiological spectrum.

Overall, the study has supported previous reports that dermatophytosis in India is predominantly

caused by Trichophyton species, with T. rubrum being the principal pathogen. The variations in clinical patterns and species distribution observed here further underline the geographical, environmental, and socio-behavioral influences. Continuous surveillance and periodic epidemiological studies are thus very important to monitor the changing trends and to guide effective management strategies for dermatophytosis in tertiary care settings.

Conclusion

This study depicts the significant burden and varies clinical spectrum of dermatophytosis amidst clinically suspected cases attending a tertiary care teaching hospital. Superficial fungal infections predominantly involved glabrous skin, where infection of the body and groin was the most frequent clinical presentation, followed by nail, foot, and hand infections, whereas scalp and beard infections were relatively less common. Laboratory diagnosis has shown that direct microscopy and culture together played a complementary role, as some cases were positive by microscopy alone whereas others were detected only on culture. This again underlines the importance of using both methods to arrive at an accurate diagnosis. Among the different clinical specimens, skin scrapings constituted the majority and yielded a high rate of fungal isolation, while hair samples showed consistent culture positivity, thus underscoring their diagnostic value. In species identification, members of the genus Trichophyton were found to be the predominant etiological agents among most clinical types, particularly infections of the skin, nails, and feet, while Epidermophyton and Microsporum species contributed to a small proportion of cases with specific clinical correlations such as groin and scalp involvement, thus indicating variation in dermatophyte species across different clinical presentations due to the influence of host factors, site of infection, and environment. The study once again emphasizes the need for routine mycological investigations including culture and species identification for proper diagnosis, epidemiology, and appropriate management of dermatophytosis in tertiary health care.

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