

Clinico-Mycological Correlation of Dermatophytosis: Analysis of Clinical Presentations, Species Identification, and Site-Specific Association with Causative Agents

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Abstract:

Background: Dermatophytosis is a common superficial fungal infection affecting keratinized tissues, with significant prevalence in tropical regions. Accurate diagnosis requires correlation between clinical presentation and mycological findings.

Aim: To analyze clinical presentations, identify dermatophyte species, and assess site-specific associations with causative agents in patients with dermatophytosis.

Methodology: A hospital-based cross-sectional study was conducted on 100 clinically diagnosed dermatophytosis cases at Sheikh Bikhari Medical College and Hospital, India. Clinical evaluation, specimen collection, KOH mount examination, and fungal culture were performed. Data were analyzed to determine clinico-mycological correlations.

Results: The majority of patients were young to middle-aged adults (21–40 years, 52%), with male predominance (58%). *Tinea corporis et cruris* (32%) and *tinea corporis* (26%) were the most common clinical types. Trunk (58%) and groin (46%) were the most affected sites. KOH positivity was 92%, while culture confirmed dermatophytes in 68% of cases. *Trichophyton mentagrophytes* (64.7%) and *T. rubrum* (23.5%) were predominant. Site-specific trends showed *T. mentagrophytes* predominance, but statistical analysis revealed no significant association between clinical type or site and species ($p > 0.05$).

Conclusion: Dermatophytosis predominantly affects young males, commonly involving trunk and groin. *Trichophyton* species are the main etiological agents, and clinico-mycological correlation enhances diagnostic accuracy. Species distribution is independent of clinical presentation or site.

Keywords: Dermatophytosis, *Trichophyton mentagrophytes*, *Tinea corporis*, *Tinea cruris*, Clinico-mycological correlation, Fungal culture, KOH mount.

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Introduction

Dermatophytosis is one of the most common superficial fungal infections affecting humans worldwide. These are a group of keratinophilic fungi, collectively known as dermatophytes, with a unique feature of invading and proliferating within keratinized tissues of skin, hair, and nails. Worldwide, dermatophytoses account for approximately 16–75% of all mycological infections, which gives an important indication of their major contribution to the overall prevalence of fungal diseases. The prevalence of dermatophytosis varies considerably with geography, with notably high rates in the tropics and subtropics, including India, due to favorable climatic conditions like high temperature, humidity, and increased sweating, which provide ideal scenarios for the growth and transmission of fungi [1].

Although it is usually not life-threatening, dermatophytosis accounts for a considerable degree of morbidity and discomfort. The condition is often accompanied by severe pruritus, cosmetic disfigurement, secondary bacterial infection, and recrudescence or chronic disease—all features that impair quality of life. Dermatophytosis is more severe and chronic in immunosuppressed patients such as those with diabetes mellitus, who have received long-term corticosteroid therapy, are malnourished, or have other forms of immunocompromised states. In these individuals, the infection can be atypical in its presentation, may become widespread, or may be resistant to conventional antifungal therapy, thus rendering management difficult.

Dermatophytosis remains an important public health problem owing to its high prevalence, contagiousness, and involvement of all age groups and both sexes. Infection is contracted by direct contact with infected humans, animals, or contaminated fomites with spores, which may be favored by overcrowding, poor hygiene habits, occlusive dressings, and sharing personal items. The rising trend of dermatophytoses in recent times can also be attributed to the irrational use of topical steroid-containing combinations that may distort clinical morphology, mask classical features, and lead to persistent or recurrent infections [2].

Clinically, dermatophytosis presents in a wide range of manifestations that depend on the anatomical site involved, the causative species, host immune response, and duration of infection. Common clinical forms are tinea corporis, tinea cruris, tinea pedis, tinea capitis, tinea faciei, tinea manuum, and tinea unguium. The lesions may vary from classical annular erythematous plaques with central clearing to atypical, extensive, eczematous, or inflammatory forms. Such variability often leads dermatophytic infections to much closely resemble other dermatological conditions like eczema, psoriasis, pityriasis rosea, and contact dermatitis, so that they are very frequently misdiagnosed and subjected to improper therapy [3].

Given this clinical overlap, laboratory confirmation has become imperative for the accurate diagnosis of dermatophytosis. A diagnosis based solely on clinical features may lead to diagnostic errors, delayed treatment, or therapeutic failure. Mycological investigations are thus important not only for confirmation of diagnosis but also for identification of the causative organism.³ Diagnostic methods commonly used include potassium hydroxide wet mount examination, Wood's lamp examination, skin biopsy, and fungal culture.⁴ KOH examination is a quick, inexpensive, and very common screening test that serves to help demonstrate fungal elements in clinical specimens. The drawback is that it does not permit species identification. Fungal culture, though time-consuming, is still the gold standard for definitive diagnosis and identification at species level of dermatophytes [4].

Species identification of dermatophytes has considerable clinical and epidemiological importance. The species may vary in pathogenicity, inflammatory response, chronicity, and response to antifungal therapy. Moreover, knowledge of the geographical distribution of dermatophyte species can give insight into prevailing epidemiological trends, thus assisting in effective treatment. This identification is vital in tinea capitis infection, being a very contagious disease and mainly affecting children. Indeed, identification of the infecting agent in tinea capitis gives an idea of possible transmission to other children in households, schools, and community settings and

assists in necessary precautionary and control measures [5].

Besides the identification of species, correlating clinical presentation with mycological findings is necessary to improve diagnostic accuracy and to understand the disease pattern. A predilection of certain dermatophyte species for specific anatomical sites exists, and such site-specific associations provide a clue to the clinician for making an informed presumptive diagnosis and choosing an appropriate empirical therapy. Clinico-mycological correlation also helps in identifying the emerging trend, shift in dominance, and changing morphology of clinical presentations, which have important therapeutic and public health implications.

Comprehensive studies integrating the clinical features with laboratory findings are highly relevant in the Indian context, where dermatophytosis is highly prevalent and is becoming increasingly resistant to therapy. The rising incidence of chronic, recurrent, and steroid-modified dermatophytosis further underscores the need for systematic evaluation of clinical presentations and their correlation with specific causative agents. Such studies can contribute to better disease characterization, rational use of antifungals, and improved patient outcomes.

The present study was thus undertaken to analyze the diverse clinical manifestations and to identify the causative dermatophyte species by employing mycological methods so as to establish correlation between the site of involvement and their specific causative agents. This research correlates the clinical patterns with laboratory-confirmed species identification to enable better understanding of dermatophytosis and provide clinically useful data that may be helpful in the correct diagnosis, effective management, and prevention of transmission.

Methodology

Study Design: This study was designed as a hospital-based cross-sectional observational study aimed at evaluating the clinico-mycological correlation of dermatophytosis, with emphasis on clinical presentations, species identification, and site-specific association with causative dermatophytes.

Study Area: The study was conducted in the Department of Skin, Venereal Diseases, and Leprosy, Sheikh Bhikhari Medical College and Hospital, Hazaribagh, Jharkhand, India.

Study Duration: The study was carried out over a period of 8 months

Sample Size: A total of 100 clinically diagnosed cases of dermatophytosis were included in the study.

Study Population: The study population comprised patients of all age groups and both sexes presenting to the Dermatology outpatient department with

clinical features suggestive of dermatophytosis during the study period.

Inclusion Criteria

- Patients of any age and gender with clinical diagnosis of dermatophytosis
- Patients who had not received topical or systemic antifungal treatment in the preceding 4 weeks
- Patients who provided written informed consent

Exclusion Criteria

- Patients who had taken topical or systemic antifungal therapy within the last 4 weeks
- Patients with non-dermatophytic fungal infections
- Patients unwilling to participate or provide consent

Data Collection: After obtaining informed consent, data were collected from all enrolled patients using a predesigned and structured proforma. Detailed demographic information, including age and sex, was recorded for each participant. A comprehensive clinical history was obtained, focusing on the duration of disease, symptoms such as itching, prior history of similar lesions, and any previous treatment taken. This was followed by a thorough dermatological examination to document the type of dermatophytosis, morphological pattern of lesions, extent of involvement, and anatomical site affected. Appropriate clinical specimens, including skin scrapings, hair, or nail clippings, were collected aseptically from the active margins of lesions and subjected to mycological investigations. Direct microscopic examination using potassium hydroxide (KOH) mount and fungal culture were performed to confirm the diagnosis and identify the causative dermatophyte species. The clinical findings were subsequently correlated with mycological results to assess clinico-mycological concordance.

Procedure: Patients presenting with clinical features suggestive of dermatophytosis were screened based on the inclusion and exclusion criteria. Eligible patients were enrolled after obtaining written informed consent. Clinical evaluation was carried out systematically, and relevant details were recorded. Specimen collection was performed under strict aseptic precautions, ensuring adequate sampling from the most active part of the lesion. The collected samples were processed for direct microscopic examination and fungal culture as per standard laboratory protocols. Culture results were observed for fungal growth and species identification. The obtained clinical and mycological data were compiled and analyzed to determine the relationship between clinical presentations, anatomical sites involved, and the causative dermatophyte species.

Statistical Analysis: The collected data were entered into Microsoft Excel and analyzed using appropriate statistical software. Descriptive statistical methods were employed to summarize demographic data, clinical patterns, and mycological findings in terms of frequencies and percentages. The association between clinical types of dermatophytosis, site of involvement, and identified dermatophyte species was evaluated using suitable inferential statistical tests such as the Chi-square test. A p-value of less than 0.05 was considered statistically significant for all analyses.”

Result

Table 1 presents the age and gender distribution of 100 study participants. The largest age groups were 21–30 years (28 participants, 28.0%) and 31–40 years (24 participants, 24.0%). Males predominated overall, with 58 participants (58.0%) compared to 42 females (42.0%). The distribution across other age groups was relatively balanced, with smaller proportions in the extremes: 0–10 years (4.0%) and >60 years (4.0%). Overall, Table 1 indicates that the study population was predominantly young to middle-aged adults, with a slight male predominance.

Age group (years)	Number, n (%)	Male	Female
0–10	4 (4.0)	2	2
11–20	12 (12.0)	7	5
21–30	28 (28.0)	16	12
31–40	24 (24.0)	14	10
41–50	18 (18.0)	11	7
51–60	10 (10.0)	6	4
>60	4 (4.0)	2	2
Total	100 (100)	58	42

Table 2 shows the distribution of clinical types of dermatophytosis among 100 cases. The most common presentation was tinea corporis et cruris, observed in 32 cases (32.0%), followed by tinea corporis in 26 cases (26.0%) and tinea cruris in 14 cases

(14.0%). Less frequent clinical types included tinea unguium (7 cases, 7.0%), tinea faciei and multiple site involvement (6 cases each, 6.0%), tinea pedis (5 cases, 5.0%), and tinea manuum (4 cases, 4.0%). Overall, Table 2 indicates that combined

involvement of the body and groin was the predominant clinical pattern in the study population.

Clinical type	Number of cases, n (%)
Tinea corporis	26 (26.0)
Tinea cruris	14 (14.0)
Tinea corporis et cruris	32 (32.0)
Tinea faciei	6 (6.0)
Tinea pedis	5 (5.0)
Tinea manuum	4 (4.0)
Tinea unguium	7 (7.0)
Multiple site involvement	6 (6.0)
Total	100 (100)

Table 3 depicts the distribution of sites of involvement among 100 study participants. The trunk was the most commonly affected site, seen in 58 cases (58.0%), followed by the groin in 46 cases (46.0%). Less frequent sites included the face (12 cases,

12.0%), feet (11 cases, 11.0%), hands (9 cases, 9.0%), and nails (7 cases, 7.0%). Overall, Table 3 highlights the predominance of truncal and groin involvement in the study population.

Site involved	Number of cases, n (%)
Trunk	58 (58.0)
Groin	46 (46.0)
Face	12 (12.0)
Hands	9 (9.0)
Feet	11 (11.0)
Nails	7 (7.0)

Table 4 summarizes the results of KOH mount and fungal culture among 100 cases. The KOH mount showed a high positivity rate, with 92 cases (92.0%) testing positive and only 8 cases (8.0%) testing negative. In comparison, fungal culture was positive in

68 cases (68.0%), while 32 cases (32.0%) were culture negative. Overall, Table 4 indicates that KOH mount was more sensitive in detecting fungal elements than fungal culture in the studied population.

Investigation	Positive n (%)	Negative n (%)
KOH mount	92 (92.0)	8 (8.0)
Fungal culture	68 (68.0)	32 (32.0)

Table 5 shows the distribution of dermatophyte species isolated on culture among 68 cases. Trichophyton mentagrophytes was the most frequently isolated species, accounting for 44 isolates (64.7%), followed by Trichophyton rubrum with 16 isolates (23.5%). Less commonly isolated species included

Trichophyton tonsurans (4 isolates, 5.9%), Epidermophyton floccosum (3 isolates, 4.4%), and Microsporum species (1 isolate, 1.5%). Overall, Table 5 highlights a clear predominance of T. mentagrophytes among the dermatophyte isolates.

Dermatophyte species	Number of isolates, n (%)
Trichophyton mentagrophytes	44 (64.7)
Trichophyton rubrum	16 (23.5)
Trichophyton tonsurans	4 (5.9)
Epidermophyton floccosum	3 (4.4)
Microsporum species	1 (1.5)
Total	68 (100)

Table 6 demonstrates the association between clinical type and culture positivity among 100 cases. The

highest number of culture-positive cases was observed in tinea corporis et cruris with 25 positive

cultures out of 32 cases, followed by tinea corporis with 18 positives out of 26 cases. Tinea cruris showed 9 culture-positive cases out of 14, while other clinical types accounted for 16 positive

cultures out of 28 cases. Overall, 68% (68/100) of cases were culture positive, while 32% (32/100) were culture negative, indicating a higher rate of culture positivity across all major clinical types.

Clinical type	Culture positive	Culture negative	Total
Tinea corporis	18	8	26
Tinea cruris	9	5	14
Tinea corporis et cruris	25	7	32
Other types	16	12	28
Total	68	32	100

Table 7 illustrates the site-specific distribution of isolated dermatophyte species among 68 cases. The trunk was the most commonly involved site with 28 cases, predominantly due to *T. mentagrophytes* (18 cases), followed by *T. rubrum* (7 cases) and other species (3 cases). This was followed by the groin with 22 cases, again mainly caused by *T. mentagrophytes* (15 cases), with fewer isolations of *T.*

rubrum (5 cases) and other species (2 cases). Involvement of the face accounted for 7 cases, hands/feet for 8 cases, and nails for 3 cases, all showing a similar predominance of *T. mentagrophytes*. Overall, *T. mentagrophytes* was the most frequently isolated species (44/68 cases), irrespective of the site involved.

Site involved	<i>T. mentagrophytes</i>	<i>T. rubrum</i>	Other species	Total
Trunk	18	7	3	28
Groin	15	5	2	22
Face	4	2	1	7
Hands / Feet	5	1	2	8
Nails	2	1	0	3
Total	44	16	8	68

Table 8 shows that there was no statistically significant association between the studied clinical parameters and dermatophyte species. The association between clinical type and species yielded a χ^2 value of 3.12 with a p-value of 0.37, indicating no significant relationship. Similarly, the association between site

involved and species showed a χ^2 value of 4.26 and a p-value of 0.23, which was also not statistically significant. Overall, Table 8 suggests that dermatophyte species distribution was independent of both clinical type and the anatomical site involved.

Variable	χ^2 value	p-value	Significance
Clinical type vs species	3.12	0.37	Not significant
Site involved vs species	4.26	0.23	Not significant

Discussion

In the present study of 100 patients, male predominance was seen in 58% of cases. This agrees with many previous studies that reveal higher susceptibility of males to dermatophytosis. For instance, Siddappa et al. (1982) [6] observed that 55.55% of cases demonstrated male preponderance, while Gupta et al. (1993) [7] and Poria et al. (1981) [8] also found males to be more commonly affected, with a male-to-female ratio varying from 1.5:1 to 1.86:1 cited by Verenkar et al. (1991); Sumathi et al. (2013) [1,9]. Male preponderance can be linked to increased physical activity, greater occupational exposure, and environmental factors that enhance perspiration and growth of fungi. Our findings are supported by all these studies, which re-establish male gender as one

of the significant risk factors for dermatophytic infections.”

In our study, the age-wise distribution showed maximum prevalence in the young and middle-aged groups, especially in the 21–30 year group (28%) and 31–40 year group (24%), which is also reflected in other reports by Sumathi et al. 2013 [9], and Agarwal et al. 2014 [10], where the highest incidence was reported between the ages of 15–30 years and 21–30 years, respectively. Our findings showed least involvement at the extremes of age, with 4% cases involving children in the 0–10 year age group and 4% in the >60 year age group, similar to the trends observed in other studies by Hanumanthappa et al. 2012 [11] and Poria et al. 1981 [8]. The vulnerability of young and middle-aged groups may be

related to increased outdoor activity, increased sweat, and occupational exposures while limited exposure and protective factors might be the explanation for the lower rates observed in the children and elderly population.

The most common presentation of the clinical pattern in our study was mixed tinea corporis and tinea cruris, which accounted for 32% of cases, followed by isolated tinea corporis (26%) and tinea cruris alone (14%). This predominance of involvement of the trunk and groin is consistent with reports by Siddappa et al. (1982) [6], where tinea corporis was the commonest type, followed by tinea cruris, and corroborates the reports from Hitendra et al. (2012) [12] and Mathur et al. (2012) [13] who also found the trunk and groin to be commonly affected sites. The site-related distribution of dermatophyte species in the present study showed that *Trichophyton mentagrophytes* was the most common isolate both from the trunk and groin, followed by *Trichophyton rubrum*. Although these findings differ from reports by Siddappa et al. (1982) [6] and Verenkar et al. (1991) [1], where *T. rubrum* was the dominant species across all clinical types, the overall dominance of the *Trichophyton* species is a universal observation, reflecting their globally widespread epidemiological prevalence in dermatophytic infections.

KOH positivity was 92% and culture positivity was 68% in our mycological analysis. This trend, showing higher detection by KOH than by culture, is similar to that described by Siddappa et al. (1982) [6], who reported 100% KOH positivity and 49% culture positivity, and Karmakar et al. (1995), who noted 86% positivity by KOH versus 41.6% by culture. Thus, the KOH mount would be a quick screening method in cases of suspected dermatophytosis, while culture remains an essential tool for species-level identification and epidemiological studies. A few studies also reported, as in our cases, that some remained culture-negative even when the KOH preparation showed positivity. This may be attributed to prior antifungal use, low fungal load, or technical reasons (Head, 1984; Hay & Moore, 1998) [3,5].

The species distribution in our study was *T. mentagrophytes* as the major isolate, 64.7%, followed by *T. rubrum*, 23.5%. This is in contrast to many studies showing *T. rubrum* as the most predominant species, for example, Siddappa et al. (1982) [6], Verenkar et al. (1991) [1], and Gupta et al. (1993) [7]. This is, however, in agreement with some regional studies like Bindu (2002) [15] and mirrors the changing epidemiology of dermatophytes influenced by climatic factors, hygiene practices, and local environment. Other less common species that were isolated included *Trichophyton tonsurans*, *Epidermophyton floccosum*, and *Microsporum* species. These findings were comparable with previous studies and establish these species as less commonly implicated in

superficial mycoses (Sumathi et al., 2013; Huda et al., 1995) [9,16].

By clinical type, *T. mentagrophytes* preponderated in mixed tinea corporis et cruris, while *T. rubrum* was relatively more common in isolated tinea corporis. However, this trend did not reach statistical significance in our study, as no significant association could be established between clinical type and species, $\chi^2 = 3.12$, $p = 0.37$; similarly, no association was found between anatomical site and species, $\chi^2 = 4.26$, $p = 0.23$, which agrees with similar observations by Karmakar et al. (1995) [14] and Sumathi et al. (2013) [9], indicating that though there is a predilection of certain species for a particular site, dermatophyte infection is widely distributed on all anatomical regions.

In fact, the distribution of the anatomical sites in our study was dominated by trunk involvement at 58% and groin at 46%, followed by facial involvement at 12%, hand at 9%, foot at 11%, and nails at 7%. The findings are in agreement with previously reported studies by Poria et al. (1981) [8] and Siddappa et al. (1982) [6] and reaffirm the preponderance of tinea corporis and cruris in adults. Less frequent involvement of nails, hands, and feet is possibly because of lesser exposure to environmental fungal sources, differences in local microenvironment, and / or protective behavioral factors. Mixed-site involvement in a sizeable proportion of patients underlines the complexity of dermatophytosis and requires adequate clinical investigation for proper management.

Overall, the present study supports many aspects of dermatophytosis epidemiology from previous literature, namely male preponderance, young and middle-aged predominance, trunk and groin being predominantly affected, and the high sensitivity of KOH mount over culture. However, the observed predominance of *T. mentagrophytes* in our population contrasts with several studies emphasizing *T. rubrum* and highlights regional variations in dermatophyte distribution. Overall, our findings support the notion that only integration of clinical evaluation with mycological confirmation can help in proper diagnosis and management of dermatophytic infection.

Conclusion

This prospective study illustrates dermatophytosis to be a disease of young to middle-aged adults with male preponderance, presenting as trunk and groin involvement, alone or in combination. The clinical patterns correlated well with the mycological findings; direct microscopy was very sensitive, and fungal culture was positive in a good number of cases. *Trichophyton* species were the main etiological agents, with *Trichophyton mentagrophytes* being the most common species, followed by *Trichophyton rubrum* in most of the clinical types and anatomical sites. Though some species tended to

occur more often at specific sites, statistical analysis did not indicate any significant association between clinical presentation, site of involvement, and the isolated dermatophyte species. Thus, the general findings emphasize that clinical features must be coupled with laboratory confirmation for accurate diagnosis and management, while the infection is clinically heterogeneous, with clinico-mycological patterns overlapping.

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