

A study of Dermatophytes at a tertiary level Hospital - Record based Cross - sectional study

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Abstract

Background: Dermatophytoses represent superficial fungal diseases restricted to keratin-rich tissues, namely the epidermis, hair, and nails. This group consists of three distinct genera, namely Trichophyton, Microsporum, and Epidermophyton, with multiple species classified under each. The prevalence of Dermatophytes varies according to geographic location and environmental conditions. The infection is common worldwide, with a higher prevalence in tropical countries

such as India. The present study was conducted to determine the proportion of Dermatophytes and to identify the fungal species responsible for the various clinical presentations.

Aim and Objective

Aim: The aim of this study was to determine the proportion of Dermatophytes at a tertiary level hospital.

Objective: To study distribution patterns of the disease among the patients attending a teaching hospital.

To identify the species of Dermatophytes isolated from clinical cultures.

Materials and Methods: This study was conducted at JMF'S ACPM Medical College, Dhule over 1 year (January 2023 to December 2024.).

In this study, a total of 95 samples - including skin scrapings, nail clippings, and plucked hair roots - were collected and examined. Each sample was processed by direct microscopy using potassium hydroxide (KOH) and cultured on Sabouraud dextrose agar (SDA) supplemented with antibiotics and cycloheximide.

Species identification was carried out based on colony morphology, lacto phenol cotton blue (LPCB) mounts, the hair perforation test, and the urease test.

Results: Out of 95 clinical samples, 45 (47.4%) yielded Dermatophytes. Of the affected individuals, 55.6% were male and 44.4% were female. Among the 45 Dermatophytes - positive samples, 29 were positive by both direct microscopy and culture, while 16 were positive only by culture. The most commonly isolated Dermatophytes genus was *Trichophyton* (95.6%), followed by *Microsporum* (2.2%) and *Epidermophyton* (2.2%). Among the *Trichophyton* species, *T. rubrum* was the most frequently isolated (44.4%) followed by *T. mentagrophytes* (40.0%) and *T. violaceum* (11.1%)

Conclusion: *Trichophyton* was the most commonly isolated Dermatophytes in this study. Males showed a higher percentage than females, with a male-to-female ratio of 1.3:1. Tinea corporis was the most frequent clinical presentation. Accurate identification of the causative Dermatophytes species is essential for guiding appropriate treatment and for implementing effective control measures.

Keywords: Dermatophytes, Superficial Fungal Diseases, *Trichophyton*, *Microsporum*, And *Epidermophyton*

Introduction

Dermatophytes are keratinophilic fungi that require keratin for their growth and these fungi can infect the hair, skin, and nails¹ *Dermatophytes* is a globally prevalent superficial fungal infection, affecting an estimated 20–25% of the world's population.²

The prevalence of dermatophytes is influenced by environmental factors, socioeconomic status, and individual susceptibility. Dermatophytic infections are more prevalent in tropical regions such as India, primarily due to factors including high temperature, elevated humidity, poverty, overcrowding, and inadequate hygiene.^{3,4} Dermatophytes - induced skin infections have emerged as a significant public health concern, affecting individuals across all age groups, including children, adolescents, and adults.⁵ Although dermatophytic infections are typically non-invasive and readily treatable, their widespread prevalence and the prolonged duration of therapy pose a significant public health challenge, leading to a substantial economic burden in developing countries such as India.⁶

Dermatophytes are aerobic fungi that produce proteases capable of digesting keratin, enabling them to colonize, invade, and infect the stratum corneum of the skin, as well as the hair shaft and nails.⁷

Infection is typically cutaneous and confined to the non-living, cornified layers of the skin, as Dermatophytes are unable to penetrate deeper tissues or organs in immunocompetent hosts.⁸

Dermatophytes are hyaline, septate molds comprising more than a hundred species. They are classified into

three main anamorphic genera based on morphological characteristics:

1. Trichophyton, which infects the skin, hair, and nails.
2. Microsporum, which infects the skin and hair
3. Epidermophyton, which infects the skin and nails.⁹

Microsporum canis is the most common zoophilic Dermatophytes worldwide, found across temperate areas as well as some tropical zones.¹⁰

Determining whether a species is geophilic or zoophilic is not always unequivocal and may occasionally be considered controversial.¹⁰

Infections caused by anthropophilic species are typically chronic and are characterized by minimal inflammation, whereas infections due to geophilic and zoophilic species tend to be self-limiting and are associated with more pronounced inflammatory responses.¹⁰

Dermatophytes proliferate centrifugally within the stratum corneum, resulting in well-demarcated, annular, pruritic, scaly lesions characterized by central clearing and elevated borders.¹¹

Different clinical forms of Dermatophytes arise depending on the specific area of the body affected.⁽¹⁰⁾

Tinea infections present in various clinical forms depending on the site of involvement. These include tinea capitis, an infection of the scalp; tinea corporis, which affects the glabrous (non-hairy) skin of the trunk and limbs; tinea pedis, involving the inter digital spaces of the toes; and tinea cruris, which occurs in the groin region. Additional forms include tinea barbae, an infection of the beard and mustache area; tinea faciei, affecting the non-bearded regions of the face; tinea unguium (onychomycosis), which involves the nail plate; and tinea manuum, an infection of the palmar surfaces of the hands.

Recurrent Dermatophytes refers to a Dermatophytic infection that persists with intermittent exacerbations and remissions.¹²

These patients may serve as a potential source of infection for their family members and close contacts. While various mechanisms have been proposed to explain the chronicity and recurrence of the infection, the exact underlying causes remain unclear.¹³

There is no universally accepted definition of 'recurrent Dermatophytes'; the term is generally used to describe a long-lasting infection characterized by alternating periods of flare-ups and remission.¹²

The rise in chronic illnesses like diabetes - driven by increased global life expectancy - and the weakened immune defenses caused by these underlying conditions have made humans more vulnerable not only to pathogenic fungi but also to fungi that were previously regarded as mere contaminants.^{14, 15}

Dermatophytes and non - Dermatophytes fungi associated with Dermatophytes have been reported worldwide, yet their distribution, incidence, epidemiology, clinical features, and preferred hosts vary from region to region. These differences are largely influenced by factors such as geography, climate, healthcare quality, cultural practices, and socioeconomic conditions.^{16, 17}

Objectives

The objectives of the study are as follows:

1. To determine the proportion of Dermatophytes in various clinical samples, including skin, hair, and nail specimens.
2. To identify the species of Dermatophytes isolated from clinical cultures.

Materials and Methods

Ethical considerations

This study was conducted following approval from the Institutional Ethics Committee (IEC) of J. M. F's A. C. P. M. Medical college and hospital granted on July 14, 2025 (Ref. No. 09/IEC/ACPMMC/Dhule).

This was a retrospective observational study from January 2023 to December 2024.

This study was carried out in the Department of Microbiology at a tertiary care center. A total of 95 - including skin scrapings, nail clippings, and hair root specimens - were collected from patients attending various outpatient departments with suspected fungal infections.

Inclusion criteria

All patients with clinically suspected Dermatophytes is during that period were included in the study.

Exclusion criteria

Patients with other skin infections were excluded from the study.

Direct Microscopic Examination (Potassium Hydroxide [KOH] Mount)

Scraping

In all cases, the collection site was cleansed with 70% alcohol, allowing it to evaporate before obtaining the specimen. This step is particularly important if greasy ointments or powders have previously been applied as treatment.¹⁰

Specimens were collected by scraping outward from the edges of active lesions using a scalpel blade held at an angle of 90° to the skin surface.¹⁰ The specimens from the scalp were obtained by scraping with a blunt scalpel so that they include hair stubs, contents of plugged follicles, and scales.¹⁰ In cases of onychomycosis, after disinfecting the nail with 70% alcohol, the specimens

were obtained by clipping from the free edge as far proximally as possible, ensuring that the full thickness of the nail is included.¹⁰

KOH Mount

The collected samples were subjected to direct microscopic examination for fungal elements using potassium hydroxide (KOH), with a concentration of 10% for skin scrapings and hair, and 20–40% for nail clippings.¹⁰ The specimens were mounted on slides under a cover slip using KOH for microscopic examination.¹⁰

This process clears the material within 5–20 minutes, depending on its thickness.¹⁰

Culture

All specimens were cultured regardless of the results of direct microscopic examination. Sabouraud Dextrose Agar (SDA) containing chloramphenicol and cycloheximide to inhibit bacterial contamination was used, and the inoculated plates were incubated for 10 days to 3 weeks at 25°C and 37°C.

The culture plates were examined every other day for fungal growth. Dermatophytes isolates were identified based on colony morphology and pigmentation.¹⁰

Lacto phenol cotton blue (LCB) Stain

A piece of transparent tape was pressed onto the surface of the fungal colony grown on the culture plate and then placed onto a slide containing a drop of Lacto phenol Cotton Blue (LCB) for microscopic examination.¹⁰

Urease Test

Christensen's urea agar was employed to differentiate Trichophyton mentagrophytes from Trichophyton rubrum.

The identification of Dermatophytes was performed based on fungal morphology, hyphal organization (septate or aseptate), and the presence and arrangement of microconidia and macroconidia.

Results

Out of 95 samples, 45 were positive for Dermatophytes. Of the affected population, 55.6% were male and 44.4% were female. The male-to-female ratio among affected individuals was 1.3:1. The most commonly affected age group was 31–40 years, accounting for 11 cases [Tables 1 and 2].

Of the 95 samples collected, 73 were skin scrapings, 13 were nail scrapings and clippings, and 9 were hair stubs [Table 3]. Among the 45 Dermatophytes - positive samples, 29 were positive by both direct microscopy and culture, while 16 were positive by culture alone.

The most commonly isolated Dermatophytes belonged to the genus *Trichophyton* (95.6%) followed by *Microsporum* (2.2%) and *Epidermophyton* (2.2%). Among the *Trichophyton* species, *T. rubrum* was the most frequently isolated (44.4%), followed by *T. mentagrophytes* (40.0%) and *T. violaceum* (11.1%) [Table 4]. The most common clinical presentation was *tinea corporis* (37.8%), followed by *tinea cruris* (24.5%) [Table 5].

Table 1: Distribution of Dermatophytes positive cases according to sex

Sex	Total	Dermatophytes-positive cases, n (%)
Male	55	25 (55.6)
Female	40	20 (44.4)
Total	95	45 (47.4)

Table 2: Age - wise distribution of clinically diagnosed Dermatophytes is

Age (years)	Number of cases
<10	6
11–20	6
21–30	06
31–40	11
41–50	7

>50	9
Total	45

Table 3: Distribution of clinical samples and results of microbiological investigation

Sample	Total number	Dermatophytes(%)
Skin scraping	73	38 (84.4)
Nail	13	2 (4.5)
Hair follicle	9	5 (11.1)
Total	95	45 (47.4)

Table no. 4: Species distribution of Dermatophytes (n = 45)

Species	Number of isolates, n (%)
<i>Trichophyton rubrum</i>	20 (44.4)
<i>Trichophyton mentagrophytes</i>	18 (40.0)
<i>Trichophyton violaceum</i>	5 (11.1)
<i>Microsporum</i> spp	1 (2.2)
<i>Epidermophyton floccosum</i>	1 (2.2)
Total	45 (100)

Table 5: Clinical types of Dermatophytes is

Clinical types	Number of cases (n=45), n (%)
<i>Tinea corporis</i>	17 (37.8)
<i>Tinea cruris</i>	11 (24.5)
<i>Tinea capitis</i>	5 (11.0)
<i>Tinea faciei</i>	4 (8.9)
<i>Tinea barbae</i>	1 (2.2)
<i>Tinea manuum</i>	3 (6.7)
<i>Tinea pedis</i>	2 (4.5)
<i>Tinea unguium</i>	2 (4.5)

Discussion

Dermatophytes is among the most common superficial fungal infections globally and is especially prevalent in tropical and subtropical regions, where high temperatures and humidity create favorable conditions

for fungal proliferation and spread. In the current study, 45 out of 95 clinically suspected cases were confirmed to have Dermatophytes is, underscoring its significant burden among patients presenting to a tertiary care hospital.

A male predominance (55.6%) was observed in our study, with a male-to-female ratio of 1.3:1.

The male predominance observed in the present study is consistent with previous reports by Bhatia and Sharma, who suggested that greater occupational exposure, increased perspiration, and frequent outdoor activities may predispose men to Dermatophytes is. Differences in cultural practices and healthcare-seeking behavior may also influence this distribution.¹⁸

The highest prevalence of Dermatophytes is was observed among individuals aged 31–40 years, which may be attributed to their active lifestyle, occupational responsibilities, close social contact, and increased perspiration, factors known to promote fungal infection. This age distribution is consistent with previous findings reported by Khan et al.,¹⁹ Dammu and Saileela,²⁰ and Kalyanappa and Sureka,²¹ all of whom identified the third and fourth decades of life as peak periods for dermatophytic infections. Similar age patterns were also documented by Dammu and Saileela²⁰ and Kaur et al.,²² suggesting that individuals in this age range, owing to higher levels of physical activity and occupational exposure, may be at increased risk.

A male predominance was evident in the current study. However; contrasting results were reported by Amin et al.²³ and Khan et al.,¹⁹ in which females constituted the majority, highlighting the influence of regional, occupational, and socio-behavioral factors on gender distribution.

Clinically, Tinea corporis was the most commonly diagnosed clinical presentation in the present study. This observation is consistent with the findings of previous studies conducted by Amin et al.,²³ Khan et al.¹⁸, Dammu and Saileela,²⁰ and Kalyanappa and Sureka,²¹ and all of which reported T. corporis as the predominant clinical manifestation of superficial fungal infections (SFIs). The consistency of these findings across different study populations highlights the widespread predominance of T. corporis among SFIs.

In the present study, T. rubrum was the predominant Dermatophytes, accounting for 44.4% of isolates, followed by T. mentagrophytes (40.0%), T. violaceum (11.1%), Microsporum spp. (2.2%), and Epidermophyton floccosum (2.2%). In some other studies done in India they have also described T. mentagrophytes as a predominant Dermatophytes.^(23, 24)

In the study conducted by Sudip Das et al.⁽²⁵⁾ of the total 53.4% of cases of Dermatophytes in the culture, contamination was seen in approximately 52% of cases and Trichophyton was the predominant organism along with T. verrucosum, followed by T. rubrum, and T. mentagrophytes.

Lakshmanan et al.⁽²⁶⁾ reported that among the non-dermatophytic fungi isolated, Candida, Aspergillus, Alternaria, Curvularia, and Fusarium were the most frequently encountered, suggesting that non-dermatophytic molds are emerging as important causative agents of superficial mycoses. These findings emphasize the need to correlate clinical suspicion with microbiological confirmation, as several dermatophytic infections closely resemble other dermatological conditions. For instance, Tinea corporis may mimic eczema, Tinea capitis can be mistaken for alopecia areata, and onychomycosis may resemble dystrophic

nails resulting from repeated minor trauma. Therefore, laboratory confirmation using potassium hydroxide (KOH) mount examination and/or fungal culture is recommended before initiating antifungal therapy to ensure an accurate diagnosis and appropriate treatment.

Conclusion

This study emphasizes the need for accurate and comprehensive diagnostic approaches in the evaluation of dermatophytosis. Since these infections may present with nonspecific clinical features, diagnosis based on a single laboratory method may not always provide reliable results. The combined use of direct microscopy and fungal culture enhances diagnostic accuracy and provides a more dependable assessment of the infection. Enhancing the diagnostic approach to dermatophytosis can significantly improve patient management by enabling timely and appropriate treatment while reducing the risk of misdiagnosis. As Dermatophytes infections remain a considerable clinical challenge, particularly among susceptible populations, the adoption of accurate and efficient diagnostic methods is essential. Improved diagnostic precision ultimately facilitates better therapeutic decisions and contributes to favorable patient outcomes.

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