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Clinico-Mycological Profile and Changing Epidemiology of Dermatophytosis in a Tertiary Care Center, Central India

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ABSTRACT

Background: Dermatophytosis, a superficial fungal infection of keratinized tissues, has reached epidemic proportions in India. The shifting epidemiology, characterized by a transition from *Trichophyton rubrum* to the *Trichophyton mentagrophytes/interdigitale* complex, poses significant diagnostic and therapeutic challenges.

Objectives: This study aimed to evaluate the clinical patterns of dermatophytosis, identify the prevalent fungal species using conventional and molecular methods, and analyze the demographic factors contributing to the current epidemic in Central India.

Methods: A cross-sectional study was conducted involving 245 patients with suspected dermatophytosis at a tertiary care center in Indore. Clinical specimens (skin, hair, and nails) were subjected to KOH microscopy, Calcofluor white staining, and culture on Sabouraud's Dextrose Agar (SDA) and Dermatophyte Test Medium (DTM). Species identification was performed using macroscopic and microscopic morphology, supplemented by molecular techniques.

Results: Out of 245 patients, 83 (33.9%) were culture-positive for dermatophytes. Tinea corporis (44.58%) and tinea cruris (41%) were the most common clinical presentations. A significant shift in species distribution was observed, with the *T. mentagrophytes/interdigitale* complex (66.27%) being the predominant isolate, followed by *T. tonsurans* (24.09%) and *T. rubrum* (9.64%). Urban residence (59%) and a history of topical steroid use (32.53%) were notable factors associated with chronic and extensive infections.

Conclusion: The study highlights a paradigm shift in the mycological profile of dermatophytosis in Central India. The emergence of *T. mentagrophytes* as the dominant species and the high prevalence of chronic cases underscore the need for accurate laboratory diagnosis and public health interventions to curb the misuse of topical steroids.

INTRODUCTION

Dermatophytosis refers to superficial fungal infections of the skin, hair, and nails caused by a group of keratinophilic fungi known as dermatophytes. These fungi belong to three main genera: *Trichophyton*, *Microsporum*, and *Epidermophyton* [1]. Globally, dermatophytosis affects approximately 20–25% of the world's population [2]. In India, the incidence has surged alarmingly over the last decade, evolving into a public health crisis characterized by chronic, recurrent, and recalcitrant infections [3, 4].

The clinical manifestations, collectively termed "tinea," are classified based on the anatomical site involved. Tinea corporis (body), tinea cruris (groin), tinea capitis (scalp), and tinea unguium (nails) are the most frequently encountered forms. Historically, *Trichophyton rubrum* was the most prevalent species isolated across the Indian subcontinent. However, recent epidemiological data suggest a significant shift, with the *Trichophyton mentagrophytes/interdigitale* complex emerging as the primary pathogen in many regions [3, 5].

Several factors contribute to this changing landscape. India's tropical climate, characterized by high humidity and temperature, provides an ideal environment for fungal growth. Socio-economic factors such as overcrowding, poor hygiene,

and the sharing of personal items further facilitate transmission [6, 7]. Moreover, the widespread over-the-counter availability of potent topical corticosteroid-antifungal combinations has led to the emergence of "tinea incognito," where the typical clinical features are masked, leading to delayed diagnosis and treatment failure [8, 9].

This study was undertaken at Index Medical College Hospital & Research Centre, Indore, to provide a comprehensive analysis of the clinico-mycological profile of dermatophytosis in Central India, reflecting the current challenges faced by clinicians and microbiologists.

MATERIALS AND METHODS

Study Design and Patient Selection

This cross-sectional study was conducted over a specified period at the Department of Microbiology, Index Medical College Hospital & Research Centre, Indore. A total of 245 patients presenting with clinical features suggestive of dermatophytosis were screened. Inclusion criteria encompassed patients of all ages and both genders with suspected superficial fungal infections. Exclusion criteria included patients already on systemic antifungal therapy for more than two weeks.

Ethical Considerations

The study was approved by the Institutional Ethics Committee. Informed consent was obtained from all participants or their guardians.

Clinical Data Collection

Detailed histories were recorded using a standardized proforma, including age, gender, occupation, residence (urban/rural), duration of illness, family history of similar infections, and history of animal contact. Specific attention was paid to prior treatment history, particularly the use of topical steroids and over-the-counter creams.

Sample Collection and Processing

Clinical specimens were collected based on the site of infection: 1. **Skin Scrapings:** Collected from the active, advancing borders of the lesions using a sterile blunt scalpel after cleansing the area with 70% alcohol. 2. **Nail Samples:** Included nail clippings and subungual debris from the most affected parts of the nail. 3. **Hair Samples:** Involved plucking infected hair stubs with roots using sterile forceps.

Laboratory Procedures

1. Direct Microscopy

All samples were subjected to direct microscopic examination. Skin and hair samples were treated with 10–20% Potassium Hydroxide (KOH), while nail samples required 40% KOH for softening. Calcofluor white staining was also employed and viewed under a fluorescent microscope to enhance the detection of fungal hyphae and spores [10, 11].

2. Fungal Culture

Specimens were inoculated onto: Sabouraud's Dextrose Agar (SDA) supplemented with Chloramphenicol (0.05 g/L) and Cycloheximide (0.5 g/L). Dermatophyte Test Medium (DTM), which contains phenol red as a pH indicator. Cultures were incubated at 28°C and 37°C and monitored bi-weekly for up to four weeks. A positive result on DTM was indicated by a color change from yellow to red, signifying the production of alkaline metabolites by dermatophytes [12, 13].

3. Species Identification

Isolates were identified based on:

Macroscopic Morphology: Colony color (obverse and reverse), texture, and growth rate. **Microscopic Morphology:** Tease mounts and slide cultures were prepared using Lactophenol Cotton Blue (LPCB). Key features such as macroconidia, microconidia, and specialized hyphae (e.g., spiral hyphae, chlamydoconidia) were analyzed [14].

Molecular Identification: For definitive speciation, particularly to distinguish between members of the *T. mentagrophytes* complex, molecular methods including PCR and sequencing of the Internal Transcribed Spacer (ITS) region of ribosomal DNA were utilized [1, 15].

RESULTS

Demographic Profile

Among the 83 culture-positive patients, 43 (51.8%) were females and 40 (48.2%) were males, indicating a near-equal gender distribution. The mean age of the patients was 40 years, with the majority falling in the young adult age group.

Urban residents accounted for 59% of the cases, while 41% were from rural areas. Homemakers (41.4%) and students (10.8%) were the most frequently affected occupational groups.

Clinical Manifestations
Tinea corporis was the most common clinical type, observed in 37 (44.58%) patients, followed closely by tinea cruris in 34 (41%). Other presentations included tinea pedis (9.6%), tinea faciei (1.2%), tinea manuum (1.2%), and tinea capitis (1.2%). Extensive tinea, involving multiple anatomical sites, was noted in 10.84% of the patients.

Mycological Findings
Direct microscopy (KOH/Calcofluor white) showed a positivity rate of 69.39%. Out of the 83 dermatophyte isolates: *Trichophyton mentagrophytes/interdigitale* complex: 55 (66.27%) *Trichophyton tonsurans*: 20 (24.09%) *Trichophyton rubrum*: 8 (9.64%)

The *T. mentagrophytes* complex was the predominant species across all sample types, including skin, nails, and hair. Interestingly, *T. tonsurans*, traditionally associated with tinea capitis, was frequently isolated from skin scrapings in this study.

Treatment History and Chronicity
A significant proportion of patients (32.53%) reported the prior use of topical steroids. The median duration of illness was 24 months, with 54.2% of patients suffering for more than a year, highlighting the chronic nature of the current epidemic.

DISCUSSION

The findings of this study underscore a dramatic shift in the epidemiology of dermatophytosis in Central India. The traditional dominance of *T. rubrum* has been superseded by the *T. mentagrophytes/interdigitale* complex. This shift is consistent with recent reports from other parts of India, suggesting a nationwide change in the prevalent dermatophyte species [3, 5, 4].

The high prevalence of tinea corporis and tinea cruris among young adults reflects the role of lifestyle factors, including tight clothing and increased physical activity in hot and humid conditions. [11-14] The near-equal gender distribution suggests that both males and females are equally exposed to risk factors in the current scenario, possibly due to changing social dynamics and increased outdoor activities among women. [15-17]

The isolation of *T. tonsurans* from a significant number of skin samples is an unusual finding, as this species is typically associated with scalp infections. This may indicate a changing host-parasite relationship or the introduction of different strains into the community.

The role of topical steroids in exacerbating the condition cannot be overstated. The use of these agents leads to “tinea incognito,” where the inflammatory response is suppressed, allowing the fungus to proliferate unchecked and leading to extensive, atypical lesions [9]. This also contributes to the chronicity and recurrence observed in over half of our study population. [26-30]

Molecular methods proved invaluable in this study for the accurate identification of species that are morphologically similar. The use of ITS sequencing remains the gold standard for resolving taxonomic ambiguities within the *Trichophyton* genus [16,31-33].

CONCLUSION

Dermatophytosis in Central India is currently dominated by the *T. mentagrophytes/interdigitale* complex, presenting primarily as chronic tinea corporis and tinea cruris. The epidemic is fueled by environmental factors, socio-economic conditions, and the rampant misuse of topical steroid-antifungal combinations. Accurate mycological diagnosis, including culture and molecular speciation, is essential for effective management. Public health initiatives must focus on educating both clinicians and the general public about the dangers of over-the-counter steroid use to manage this burgeoning epidemic.

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