



## Commentary

# Difficult to treat superficial fungal infections: Which factors one should consider in clinical practice – An Indian perspective

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## ABSTRACT

Dermatophytosis is a superficial fungal infection caused by filamentous fungi- dermatophytes affecting the skin, hair and/or nails. They have also been termed tinea infections. Dermatophytes, the most common contributing agents, are pretending high importance in developing countries like India. Emerging Pathogen Causing Recalcitrant Dermatophytosis like *Trichophyton indotineae*, which is terbinafine resistant. Development of Anti-fungal resistance due to irrational usage of antifungals, steroid misuse, availability of topical creams with steroid combination on OTC, improper and inadequate treatment, lack of patient counselling and education are the most important factors which made dermatophyte difficult to treat. Proper diagnosis, correct selection of anti-fungal, with adequate duration of therapy, avoidance of steroid, patient education on lifestyle changes will be probable solutions in resolving current challenges.

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## 1. Introduction

Dermatophytosis, commonly known as ringworm infection due to the circular shape, itchy and inflammatory lesions seen in the classical form of the disease. The occurrence of dermatophytosis in India ranges between 36.6 to 78.4%.<sup>1</sup>

The predominant species causing skin and nail infections is *T. rubrum* and then another species that follows is *T. mentagrophytes/T. interdigitale* complex. Dermatophytes can infect the outer layers of skin, hair, and nails, leading to a variety of symptoms depending on the location and severity of the infection. It's a communicable disease that spreads by direct or indirect contact.

India is suffering from an ongoing epidemic of dermatophytosis. Recurrent and clinically unresponsive dermatophytosis is being increasingly observed.

Chronic Dermatophytosis is defined, when the patients suffered from the superficial fungal infection for more

than 6 months to 1 year, with or without recurrence and in spite of being treated effectively. Recurrent Dermatophytosis is considered when there is re-occurrence of the disease (lesions) within few weeks (< 6 weeks) after complete treatment and Relapse represents the occurrence of dermatophytosis (lesions), after a prolonged period of infection-free interval (6–8 weeks) in a patient who has been clinically cured.<sup>2</sup>

### 1.1. Causes of difficult to treat dermatophytosis (superficial fungal infections)

Dermatophytosis, has been a significant health concern in India in recent years. Here are some key points about dermatophytosis in India:

### 1.2. High prevalence

Dermatophytosis has shown a high prevalence in India, with numerous reported cases across various regions of the country. Factors contributing to this prevalence include the

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hot and humid climate, overcrowding, and limited access to healthcare in some areas.

### 1.3. *Trichophyton indotineae*: Rising pathogen causing recalcitrant dermatophytoses

*Trichophyton* (T.) *indotineae* is a newly discovered dermatophyte genus that has been found on the Indian subcontinent. The contributing dermatophyte has replaced the anthropophilic *Trichophyton* (T.) *rubrum*, the earlier major dermatophyte not only responsible for tinea pedis and tinea unguium (onychomycosis), but also for dermatophytosis involving the entire body, worldwide—including India over the last few decades. The newly appeared fungus—*T. mentagrophytes* genotype VIII, now called T. *indotineae*—frequently causes inflammatory and pruritic lesions of difficult-to-treat tinea cruris, tinea corporis, and tinea faciei. There is evidence suggesting its spread from the Indian subcontinent to a number of populations worldwide. According to recent knowledge, transmission of T. *indotineae* occurred from person to person. T. *indotineae* often starts as tinea corporis, tinea cruris, or tinea genitalis, sometimes in tandem, as inflammatory or hyperpigmented scaly and itchy lesions. On occasion the lesions are difficult to consider as dermatophytosis, but in time lesions in the groin spread posteriorly to the gluteal region and to the trunk and extremities as direct spread, leading to development of large lesions. The terbinafine resistance of T. *indotineae* was initially observed clinically by the fact that the dermatophytosis does not respond to medication and worsens despite adequate oral antifungal therapy.<sup>3</sup>

### 1.4. Limited access to healthcare

In some rural areas, access to healthcare facilities and dermatologists may be limited. This can delay diagnosis and appropriate treatment.

### 1.5. Outbreaks

India has witnessed several outbreaks of dermatophytosis, particularly in urban areas. These outbreaks are often linked to factors like poor hygiene practices, the sharing of contaminated personal items, and the misuse of over-the-counter topical steroids.

### 1.6. Antifungal resistance<sup>4</sup>

The overuse and misuse of antifungal medications, including topical steroids, have led to the emergence of antifungal-resistant strains of dermatophytes, making treatment more challenging. Antifungal resistance can be described as microbiologic or clinical resistance or as an amalgamation of the both. a) Microbiologic resistance: Defined as non-susceptibility of a fungus to an antifungal

agent by in vitro susceptibility testing, in which the minimum inhibitory concentrations (MICs) of the drugs surpass the susceptibility breakpoint for that fungus. (b) Clinical resistance: persistence or progression of fungal infection even with appropriate antifungal therapy. Such failures can be attributed due to incorrect diagnosis, wrong selection of antifungal, suboptimal dose or duration of therapy and lack of patient compliance. A successful clinical response to antifungal therapy depends on the susceptibility of the fungus to particular antifungal agent, also relies on the host immune system, penetration and retention of drug in dermal layers, patient compliance, and absence of persistent focus of infection.

*In vivo* resistance is also linked with antifungal misuse because patients frequently don't follow complete course of treatment. Hence, the inadequate use or dosage of antifungal drugs contributes to the failure in eliminating the fungus completely, promoting growth of the most resistant strains, which leads to hard-to-treat fungal infections. Another way of resistance has been ascribed to biofilm production by the dermatophytes. Both *T. mentagrophytes* & *T. rubrum* have been shown to produce biofilms. Biofilms are known for resistance to antifungal agents.<sup>4,5</sup>

### 1.7. Steroids misuse

Steroids can suppress the immune system and reduce inflammation, which might temporarily alleviate some symptoms like itching and redness associated with dermatophytosis. However, they do not treat the underlying fungal infection and can actually make it worse. Steroids can promote the growth of fungi, including dermatophytes, and lead to a more severe and persistent infection. It can also mask the symptoms, making it harder to diagnose and treat the condition effectively. Topical cream containing steroids with antifungal/antibacterial agents are widely available without a doctor's prescription in India, are sold over the counter (OTC), and are often recommended by pharmacists.<sup>2</sup> Tinea incognito is a term used to describe a dermatophyte (fungal) infection that has been treated with topical steroids, which then leads to an atypical presentation of the infection. When topical steroids are applied to a fungal infection like tinea (ringworm), they can suppress the typical signs of inflammation such as redness, itching, and scaling, making it appear as though the infection is improving. However, underneath the surface, the fungus continues to grow and spread. This can lead to a deeper and more extensive fungal infection, making it difficult to diagnose accurately without specialized tests like skin scrapings or cultures. Treating tinea incognito involves discontinuing the use of steroids and starting appropriate antifungal treatment. Double-edged tinea, ring in ring appearance lesions with thick edges, pustular lesions, and multiple annular lesions of variable sizes are common presentation with steroids modified tinea. Due to steroid

usage there is significant change in the skin microbiome and the local immune system was observed.<sup>6</sup>

### 1.8. Awareness and education

Healthcare authorities and organizations in India have been working to raise awareness about proper hygiene practices, the responsible use of antifungal medications, and the importance of seeking medical advice for skin conditions.

### 1.9. Self-medication

Many individuals in India resort to self-medication, often using topical steroids without medical supervision. This not only worsens the condition but also contributes to antifungal resistance.

### 1.10. Treatment cost

The cost of antifungal medications can be a barrier to effective treatment for some individuals, especially those with limited financial resources.

### 1.11. Chronic and recurrent cases

Dermatophytosis can become chronic or recurrent in some cases, leading to frustration and a need for prolonged treatment.

A consensus statement drafted by the IADVL Taskforce Against Recalcitrant Tinea (ITART) recommends against the use of synthetic and tight garments. The statement also opposes wearing bands, drawstrings, threads and rings as they could carry fungus and add to persistence and recurrence of fungal infection.

Treatment of dermatophytosis by dermatologists or trained physicians and increasing awareness of the public regarding the current situation about tinea in the country would help to improve the current crisis.<sup>7,8</sup>

## 2. Conclusion

Difficult to treat superficial fungal infections is a major challenge in front of all health care professionals. Several factors have been identified to be responsible for the development of recurrent and chronic dermatophytosis. These include the usage of irrational fixed drug combinations (FDC) of steroid-antibiotic- antifungal creams, increasing use of broad-spectrum antibiotics, the growing numbers of immune-compromised people, Emergence of *Trichophyton indotineae* and the extensive use of antifungals in the agricultural industry and development of antifungal drug resistance. Proper

diagnosis, correct selection of anti-fungal, with adequate duration of therapy, avoidance of steroid, patient education on lifestyle changes will be probable solutions in resolving current challenges. To address these challenges, efforts are being made in India to promote responsible use of antifungal medications, improve hygiene practices, and raise awareness about the condition. Dermatologists are also working on treatment guidelines and strategies to manage resistant cases.

## 3. Source of Funding

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## 4. Conflict of Interest

None.

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