

Clinico-etiological Study of Tinea Corporis: Emergence of *Trichophyton mentagrophytes*

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Abstract

Background: Tinea corporis is a superficial fungal infection of the glabrous skin of the trunk and extremities caused by closely related organisms of the three genera – *Trichophyton*, *Microsporum*, and *Epidermophyton*, collectively known as dermatophytes. The prevalence of the different species varies according to geographic and climatic regions. *Trichophyton rubrum* has been reported from various worldwide (up to 80%) and Indian studies (up to 88%) as the most common causative organism of tinea corporis.

Aim: The aim of the study was to study the clinico-etiological profile of tinea corporis in a tertiary care center.

Materials and Methods: A total of 74 patients clinically diagnosed with tinea corporis fulfilling the inclusion criteria were recruited into the study. A detailed clinical history was obtained, and clinical examination was done and documented. Scrapings from the active margins of the skin lesions were taken for potassium hydroxide (KOH) mount and fungal culture on Sabouraud's dextrose agar.

Results: KOH microscopy was positive in 91.9% of patients. The sensitivity of KOH microscopy in the study was 94.2% and specificity was 40% with a positive predictive value of 95.6% and a negative predictive value of 33.3%. Fungal growth was observed in 74.3% of the samples cultured. *Trichophyton mentagrophytes* was the most common dermatophyte isolated (64%) followed by *Trichophyton tonsurans* (20%) and *T. rubrum* (12%).

Conclusion: *T. rubrum* only accounted for 12% of cases in this study. *T. mentagrophytes* was the most common pathogen isolated which has not been previously reported from our geographical location, and only very few reports from other parts of the world. The emergence of this organism warrants a renewed look into the antifungal susceptibility patterns for combating this common superficial fungal infection efficiently.

Key words: Dermatophytes, Fungal culture, Fungal skin infection, Potassium hydroxide mount, Tinea corporis, *Trichophyton mentagrophytes*, *Trichophyton rubrum*

INTRODUCTION

Superficial fungal skin infections are quite common and affect millions of people the world over. Dermatophytes are the most common causative agents of these superficial fungal infections with an estimated 10-20% lifetime risk of acquiring one.¹ It is indeed possible that almost every human

being, belonging to any race or geographical location, during the course of his or her lifetime will be infected by dermatophytes at some point.^{2,3} Dermatophytes are a group of closely related fungi belonging to three different genera (*Trichophyton*, *Microsporum*, and *Epidermophyton*) that produce a skin infection, in humans and other animals, termed dermatophytosis, commonly referred to as “Ringworm” or “Tinea.”^{4,5} These species are further classified as geophilic, zoophilic, or anthropophilic based on whether they predominantly reside in the soil, on animals, or on humans, respectively.⁶ There is significant variability in the incidence and distribution of these fungal infections worldwide as the prevalence of the different species varies with geographic regions, climatic conditions, local cultural

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practices, and socioeconomic conditions.^{7,8} Areas with high humidity, overcrowding, and poor hygienic conditions are the predisposing factors for dermatophytosis making it one of the major public health problems in many countries.⁹

The dermatophyte infection of the glabrous skin of the trunk and extremities is termed tinea corporis and can be caused by any of the dermatophytes though most frequently attributed to the prevailing fungi of that particular region.¹⁰ It is the most common dermatophyte infection in India and abroad.^{6,8} Clinically presents with single or multiple, confluent, annular and polycyclic plaques with varied inflammatory responses. Milder lesions show peripheral scaling and minimal erythema while highly inflammatory lesions show pustular margins and marked erythema.¹¹ *Trichophyton rubrum* is responsible for up to 80% of cases of tinea corporis worldwide while in India it is accountable for up to 88% of cases followed by *Trichophyton mentagrophytes* (up to 35% of cases).^{6,8} *Microsporum canis* is associated with 14% of tinea corporis infections worldwide and in India, making it the third most common causative organism, followed by *Epidermophyton floccosum* (up to 8%).

Recent studies have shown that there has been a significant change in the worldwide distribution of these dermatophytes over the century, due to constant competition for their specific environment, leading to emergence of the predominant species and displacement of the others.⁸ These changes are ascertained by laboratory cultures of infected cutaneous tissues collected continuously, and the data used to compare the past and present trends, to predict increasing antifungal resistance and the need for newer drugs.¹²

The diagnosis of tinea corporis is mostly clinical though it is prudent and occasionally essential to involve laboratory testing which includes direct microscopy of the specimen in 10% potassium hydroxide (KOH) solution and fungal culture in Sabouraud's dextrose agar (SDA) medium.¹³ In experienced hands, KOH microscopy has been widely advocated to be more sensitive and reliable than fungal cultures for demonstrating dermatophytes as culture techniques have a limited role because of the expense and time involved.^{13,14} Given the nature of species variability region-wise, and the recent rise in antifungal resistance observed clinically, this study was undertaken to identify the clinico-etiological profile of tinea corporis.

MATERIALS AND METHODS

This study was conducted in the Department of Dermatology, Pondicherry Institute of Medical Sciences, Pondicherry, India. A total of 74 patients clinically diagnosed with tinea corporis and fulfilling the inclusion

criteria were taken into the study. Patients under 16 years of age and those who had undertaken any topical or systemic antifungal therapy in the past 2 months at the time of presentation were excluded from the study. A detailed clinical history was taken and physical examination done in all the cases, and the data were entered in a proforma. The infected lesions were scraped to obtain specimens to confirm the presence of fungal infection by microscopic examination and culture. The lesions were thoroughly cleaned free of any debris by using 70% alcohol to reduce bacterial contamination. The area was then allowed to dry thoroughly. Scrapings of the skin were taken with a no. 15 sterile surgical blade held vertically to the skin from the edge of the lesions. Scrapings were collected directly onto the slide for KOH-microscopy and onto a sterile folded paper (which kept the specimen dry) placed inside a sterile glass container, for transport to the microbiology lab for culture.

For KOH microscopy, a drop of 10% KOH was added to the sample collected on the slide. A cover slip was applied with gentle pressure to drain away excess KOH. The slides were kept at room temperature for 20 min for clearing of the keratin. Slides were then examined microscopically at 400× magnification. The test was considered positive when long, branching, septate, hyaline hyphae were present.

For fungal culture, the scales obtained in the sterile container were transferred into a set of 4 screw-capped tubes, two containing SDA and two with Emmon's modified SDA, and sealed with parafilm. One of each was incubated at 25°C and 37°C. Observation for growth was done every week for a total of 6 weeks. If growth was observed, a lacto-phenol cotton blue (LPCB) preparation was done from the culture for species identification. The species identification was done by growth characteristics on the culture media, the reverse of the colonies, conidial morphology, arrangement, and biochemical tests such as growth on urease medium and cornmeal agar. If the species could not be identified, then a microslide culture was done from that culture specimen using a square block of agar on a glass slide and incubated at 25°C. After growth on slide culture, the agar was removed, and the coverslip was examined microscopically after staining with LPCB, and the species of dermatophyte was identified. Cultures that did not show any growth at the end of 6 weeks were considered negative.

OBSERVATIONS AND RESULTS

Out of the 74 patients included in the study, 42 were male (56.76%) and 32 were female (43.24%). The age-group and gender-wise distribution of the patients are shown in Figure 1. In this study, of the 74 patients diagnosed with tinea corporis, 32 patients were found to have associated

tinea cruris (43.24%), 3 patients with tinea faciei (4.05%) and 3 others with tinea unguium (4.05%).

KOH microscopy was positive in 68 (91.90%) of the patients while only 55 (74.30%) patients showed growth on fungal culture. Of the 68 patients with positive KOH findings, 17 patients (22.97%) had a negative culture and of the 6 patients who had a negative KOH, 4 patients (5.40%) had a positive culture. KOH microscopy and culture were both positive in 51 patients (68.92%) and both negative in 2 patients (2.70%). The sensitivity of KOH in the study was calculated to be 94.20% and specificity as 40.00% with a positive predictive value of 95.59% and a negative predictive value of 33.33%.

On fungal culture, as depicted in Figure 2, *T. mentagrophytes* was the most common organism isolated (32 samples, 43.24%) followed by *Trichophyton tonsurans* in 10 samples (13.51%). *T. rubrum* was grown in 6 (8.11%) samples and *E. floccosum* in 2 (2.70%). Four (5.48%) cultures grew *Candida* spp., 1 (1.35%) grew *Cladosporium* spp. and 19 samples (25.68%) did not show any growth. Of the dermatophytes cultured, *Trichophyton* spp. constituted 96% (48 out of 50 samples) and *T. mentagrophytes*,

32 out of 50 samples, was the most common dermatophyte isolated (64%) followed by *T. tonsurans* (20%). *T. rubrum* accounted for 12% and *E. floccosum* for 4%. *Microsporum* spp. was not isolated from any of the patients who were included in this study. The mycological pattern of dermatophytes isolated in the study is depicted in Figure 3. The culture characteristics and fungal identification of *Trichophyton* mentagrophytes are depicted in Figures 4a, b and 5 respectively.

DISCUSSION

This study showed that the majority of the patients with tinea corporis were in the age group 21-40 (48.65%) which is similar to findings reported in other studies. This could be due to the fact that this is the group of the population indulging in greater physical activity, such as agriculture, outdoor activities, and sports that leads to increased sweating and therefore predispose to the disease. The study showed an overall predominance of tinea corporis in males (56.76%). This is in concordance with studies

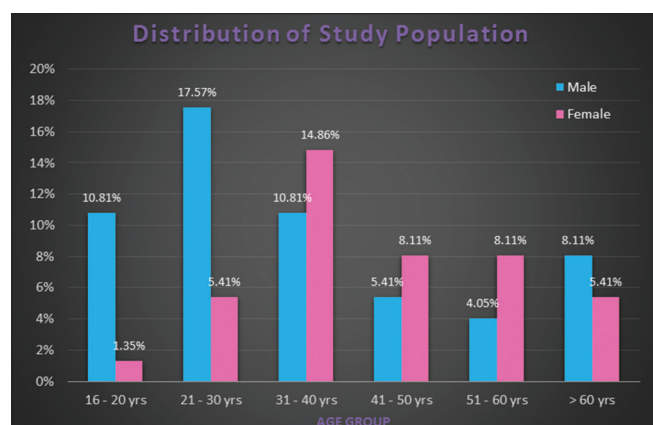


Figure 1: Age-group and gender-wise distribution of the study population

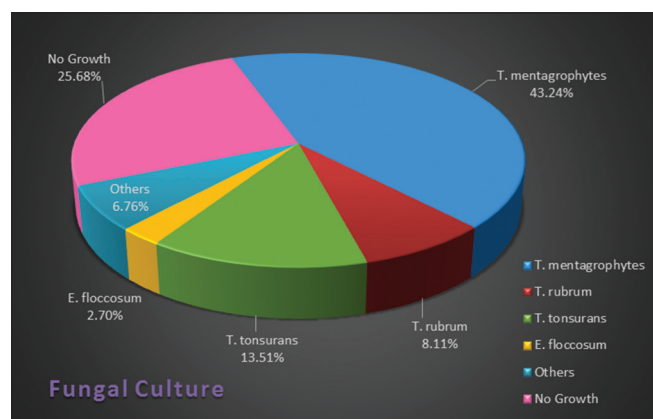


Figure 2: Fungal culture

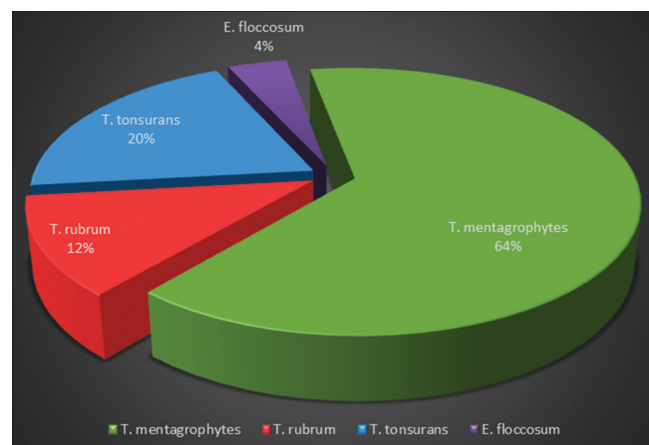


Figure 3: Mycological pattern of dermatophytes



Figure 4a: *Trichophyton mentagrophytes*: Cream colored colonies with raised central tufts and suede-like surface grown on Sabouraud's dextrose agar medium



Figure 4b: *Trichophyton mentagrophytes*: Yellow-brown pigmentation on the reverse of the colonies

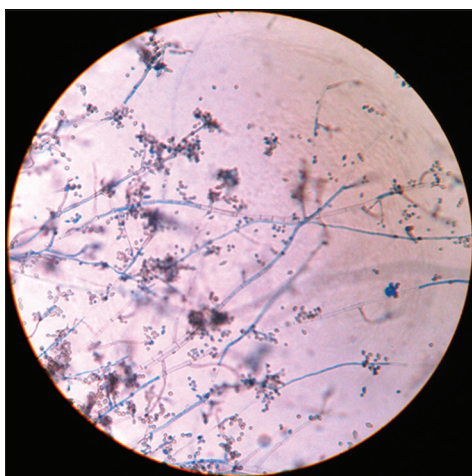


Figure 5: *Trichophyton mentagrophytes*: Clustered, round microconidia and occasional cigar-shaped macroconidia (lacto-phenol cotton blue mount)

reported both from India and abroad. The lower incidence in females could also be due to non-reporting of females in the 16-30 age groups due to the prevailing social stigma in the rural community. However, it was interesting to note that tinea corporis was more common in females than males in the age group 31-60 years which has not been reported from earlier studies.

In this study, the most common dermatophyte isolated was *T. mentagrophytes* (64%). There is no known previous similar report from this region. The previous highest reports of *T. mentagrophytes* in India were by Behl and Sharma from Delhi¹⁵ and by Sundaram *et al.*¹⁶ from Madras (47.3% and 49.23%, respectively) in cases of tinea corporis. From reports worldwide and other studies in India, *T. rubrum* has been reported as the most common dermatophyte causing tinea corporis,^{8,12,17,18} while it only accounted for 12% in our study. In our study, the second most common

dermatophyte was *T. tonsurans* (20%). This high incidence is being reported from this region for the first time. The previous studies from Kashmir by Bharadwaj *et al.*¹⁹ and from Iran by Bassiri-Jahromi *et al.*²⁰ had shown a high incidence of *T. tonsurans*, 66.2% and 50.9%, respectively, causing tinea corporis while no other reports have shown such a high incidence. *E. floccosum* accounted for 4% of cases in our study which is in concordance with most of the studies from India. Although recent studies from Europe had reported a high incidence of *M. canis* causing tinea corporis, most of the Indian studies including ours had not found such an incidence. In our study, 5.48% of the culture had grown *Candida* spp. and 1.35% *Cladosporium* spp. which was similar to the study by Garg *et al.*¹ who had also reported growth of *Candida* and other non-dermatophyte molds in culture.

The KOH microscopy was positive in 91.9% of cases while culture was positive in only 74.3% of cases. The positivity of KOH microscopy was quite similar to that of Bindu *et al.*¹⁸ who reported a KOH positivity of 89% in cases of tinea corporis but higher than that of most of the studies from India and abroad who had reported a positivity ranging from 59% to 80%.^{1,16,18} The culture positivity (74.3%), in our study, was the highest compared to all the studies from India and abroad where it has been reported between 25.8% and 69%. The sensitivity of KOH in the study was 94.2% and specificity of 40% with a positive predictive value of 95.59% and a negative predictive value of 33.33%. This was quite similar to reports by Mohanty *et al.*¹³ who showed KOH microscopic examination was 89.41% sensitive with a positive predictive value of 93.02% and Haldane *et al.*²¹ who found KOH examination to have a sensitivity of 88%. Although the specificity in this study was lower than that of these two studies, it is in concordance with Garg *et al.*¹ who reported a KOH specificity of 47.6%.

CONCLUSION

Dermatophytosis requires a multifaceted approach and antifungals play the most key role in combating these infections. The mycological profile of dermatophytosis in one particular region helps to identify the suitable antifungal agent for clearance of this infection. Although, worldwide and from most studies in India *T. rubrum* has been reported as the most common dermatophyte causing tinea corporis it only accounted for 12% of cases in this study. *T. mentagrophytes* was the most common pathogen isolated which has not been previously reported from our geographical location and only very few reports from other parts of the world. The emergence of this organism warrants a renewed look into the antifungal susceptibility

patterns for combating this common superficial fungal infection efficiently.

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