

# Clinico Mycological Profile of Dermatophyte Infections at A Tertiary Care Hospital from South India

Pellakuru Preethi<sup>1</sup>, Murali Narasimhan<sup>1</sup> , Maheswary Datchanamoorthy<sup>2\*</sup> , Hemamalini<sup>2</sup> , Muthu Bharathi<sup>1</sup>  and Leela Kakithakara Vajravelu<sup>2</sup> 

<sup>1</sup>Department of Dermatology, SRM Medical College Hospital and Research Centre, SRM Institute of Science and Technology, Kattankulathur 603203, Chengalpattu, Tamilnadu, India.

<sup>2</sup>Department of Microbiology, SRM Medical College Hospital and Research Centre, SRM Institute of Science & Technology, Kattankulathur, Chengalpattu, Tamilnadu, India.

## Abstract

The prevalence of Dermatophytosis is similar in several continents of the Asian country. The varied state of weather is favourable for mycosis that may lead to various clinical symptoms and infection spreads speedily if left untreated with time. The aim of the present study is to determine the clinical and mycological pattern of dermatophyte infections in patients arriving at our dermatology outpatient department and also to correlate the formal clinical diagnosis with KOH positivity and culture positivity. This descriptive observational study was conducted among 300 patients presenting with dermatophyte infections who came to the dermatology outpatient Department of SRM Medical College and research centre, Kattankulathur, Chengalpattu. The clinical specimens were put through direct microscopy by Potassium Hydroxide (KOH) mount and with the culture on Sabouraud's Dextrose Agar (SDA). The study showed males were affected mostly and most of the participants were students. The common symptoms observed were Itching, Scaling and Discolouration. Commonly, patients had a primary diagnosis of *Tinea corporis* infection followed by *T. cruris*. *Trichophyton mentagrophytes* were the commonly isolated organism followed by *Trichophyton rubrum* and *Trichophyton violaceum*. This study indicates the need for personal hygiene and the disadvantage of as only few participants had zoophilic infections of *Tinea* species. These methods of diagnosing and identification will further aid in better patients management.

**Keywords:** *Tinea cruris*, *Tinea corporis*, Trichophyton Mentagrophytes, Dermatophytic Infections

\*Correspondence: drmagidatchu@gmail.com

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## INTRODUCTION

Dermatophytosis is one of the most common diseases in the world, caused by the dermatophytic fungi such as *Trichophyton*, *Microsporum*, and *Epidermophyton* colonising keratinized tissue of the hair, skin, and nails.<sup>1,2</sup> Infections of the foot are the most frequent type of dermatophytosis, with an estimated lifetime risk of 10-20% worldwide. They were commonly known as ringworm or Tinea and obstructed to the non-living corniculate layers due to their incapability to go deeper in the immunocompetent host.<sup>3,4</sup> Pruritis was found to be the commonest indication which was seen in humans with dermatophyte infection as it depends on the host's reaction and environmental components. Also, the infection may occur from mild forms like seborrheic dermatitis to critical forms like favus.<sup>5,6</sup>

The epidemiological shift in dermatophyte growth patterns that gives them an advantage of better survival and persistence, an evolution in the genetic makeup of the fungi that increases their virulence and pathogenicity, and the rapid emergence of drug-resistant species as a result of the widespread use of insufficient doses of potent antifungals are all possible causes of the rising trend of recalcitrant dermatophytoses.<sup>7</sup>

These infections can be confused with other skin disorders; thus, a preliminary laboratory diagnosis is useful at the beginning of the treatment.<sup>8</sup> Although most of the dermatophytic infection is non-interventive and straight forward to cure, its extensive universal nature, social embarrassment, disablement of quality of life and harm to the lucrative standing because of the price of the treatment square measure major public considerations.<sup>9</sup> The aim of the present study is to determine the clinical and mycological pattern of dermatophyte infections in patients arriving at our dermatology outpatient department and also to correlate the formal clinical diagnosis with KOH positivity and culture positivity.

## MATERIALS AND METHODS

It was an illustrative study which was taken to estimate the clinical-mycological profile of dermatophytic infections. The specimens were gathered from January 2019 to June

2020 from the individuals who are clinically diagnosed with Dermatophytosis. Ethical approval was obtained from the Institute Ethical Committee (Human Studies) on 2<sup>nd</sup> February 2017 (1138/IEC/2017). Patients who have applied any kind of topical medications including steroids, Antifungals, antibacterials, antiseptics, native medications for the past one month or on current use are excluded.

An Informed and written consent form has been acquired from all the study participants in this current investigation. In case of children, permission was taken from their parents. A detailed history was taken with emphasis on age, gender, occupation, site, type, duration of symptoms, personal hygiene, type of clothing, footwear habits, associated diseases, sharing of Fomites, contact with pets, history of recurrence, history of similar previous episodes, duration of previous episodes, treatment taken from either over the counter or physician or dermatologist, duration of treatment taken, presence of any symptom free period were all noted.

### Sample collection

The samples were collected depending on the site of infection. If it is skin, scrapings from the edge of the lesion and clipping of nail and under the nail debris in case of nail infection were collected. Impaired hair was plucked from the base using clean aseptic forceps along with scrapings. Specimens from infected sites were collected aseptically and cleaned the area using 70% isopropyl alcohol and allowed to dry. A sample of the skin was scrapped from the active fringe of the lesion; clippings of nails and subungual junk were gathered and infected hair with the base was taken for examination. The direct microscopic examination of hair and skin was processed in 10% Potassium hydroxide solution and for nails in 40% Potassium hydroxide solution to search for arthrospores.

### Isolation of dermatophytes on culture

The dermatophytic culture was separated into a group of tubes of Sabouraud's dextrose agar (SDA) where a set was mixed with chloramphenicol (0.05mg/ml) and another with chloramphenicol and cycloheximide (0.5mg/ml). One will be incubated at 25°C where as the other at 37°C for

4 weeks and ascertained twice a week. Those grown were observed for the growth rate of colonies, megascopic characters like pigment and texture.<sup>10-12</sup>

### Species identification

Macroscopic characters were observed through lactophenol cotton blue stain and microslide culture. Identification will be finalized based on various arrangements of hyphae (coiled, pencil, spindle or club form, their septate, nodular organ), the agamogenesis pattern and the presence of microconidia and macroconidia. Biochemical identification tests such as urea hydrolysis and hair perforation are performed wherever needed. Tubes were examined for the presence of growth after 4 weeks and the results were recorded.

### Statistical analysis

Descriptive analysis is dispensed through the mean and variance for quantitative, proportion and frequency for unconditioned variables. Data collected were plotted through suitable diagrams like a pie and diagram and box plots. The coalition between diagnosis, culture & KOH positive was evaluated by cross tabulation and percentage comparison. Chi square test is used to examine the analytical significance. P values < 0.05 were taken as importance. IBM SPSS version 13 was used for arithmetical analysis.

## RESULTS

In this study, the mean age was 28.47 ± 15.23 (Table 1) with 194 (64.70%) male and 106 (35.50%) female participants. Out of 300 participants, 26 (8.70%) were agriculturists, 141(47%) participants were students, 47 (15.70%) participants were housewives, 36 (12%) participants were a labourer and 50 (16.70%) participants were others. Itching, scaling and discoloration are the most common symptoms with 114 (38.00%) participants having a recurrence and 81 (27%) participants had a similar family history. 131 (43.70%) participants had pets. Among the study population, 36 (12%) participants had type II diabetes mellitus, 3 (1%) participants had systemic hypertension, 4 (1.30%) participants had bronchial asthma, and 5 (1.70%) participants had

hypothyroidism.

About 16% of participants had a groin infection. The proportion of scalp, Abdomen+ Groin, Abdomen +Back, face and abdomen were 8.3%, 7.3%, 8%, 6.7% and 6%, respectively. The majority of the study participants had infections caused by *Tinea corporis*, as it accounts for about 31.30%, followed by *T.cruris* (16%), *T.capitis* (8.30%), *T.faciei* (6.70%), and *T.pedis* (5%) respectively. Among the *Tinea corporis* infected individuals, 83 (27.7%) participants had an annular type, 5 (1.7) participants had an eczematous type, 4 (1.3%) participants had a Black dot tinea, and 1 (0.3%) participant had crusted type and psoriasiform type. Among the *Tinea capitis*, 13 (4.3%) participants had black, 8 (2.7%) participants had a grey patch, and 4 (1.3%) participants had kerion.

Among the *Tinea barbae*, 7 (2.3%) participants had a superficial type, and 4 (1.3%) participants had a Circinate type. Among the *Tinea pedis* infected individuals, 11 (3.7%) participants had a chronic intertriginous type, and 4 (1.3%) participants had a vesicular or vesiculobullous type. Among the *Tinea manuum* infected individuals, 9 (3%) participants had non-inflammatory squamous form. Among the study population, 48 (16%) participants had *Tinea cruris*. Among the study population, 20 (6.7%) participants had *Tinea faciei*. Among the mixed type, majority proportion 8.7% participants had an Annular type (*Tinea corporis*) + *Tinea cruris*. The proportion of Annular type (*Tinea corporis*) + chronic intertriginous type (*Tinea pedis*) and *Tinea cruris*, chronic intertriginous type (*Tinea pedis*) was 8.7% and 2%, respectively (Table 2).

Among the study population, 156 (52%) participants had KOH positive + Culture

**Table 1.** Descriptive analysis of age group in the study population (N=300)

Age group	No. of cases	Percentage
Up to 10	21	7.0%
11 to 20	99	33.00%
21 to 30	78	26.00%
31 to 40	39	13.00%
41 to 50	34	11.30%
51 to 60	13	4.30%
61 and above	16	5.30%

**Table 2.** Descriptive analysis of morphological patterns with the site of involvement of the disease in the study population (N=300)

Subtype	No. of cases	Percentage
<b><i>Tinea corporis</i> (N=94)</b>		
Annular type	83	27.7%
Eczematous type	5	1.7%
Plaque type	4	1.3%
Crusted type	1	0.3%
Psoriasiform type	1	0.3%
<b><i>Tinea Capitis</i> (N=25)</b>		
Black Dot	13	4.3%
Grey patch	8	2.7%
Kerion	4	1.3%
<b><i>Tinea barbae</i> (N=11)</b>		
superficial type	7	2.3%
Circinate type	4	1.3%
<b><i>Tinea pedis</i> (N=15)</b>		
chronic intertriginous type	11	3.7%
vesicular or vesiculobullous type	4	1.3%
<b><i>Tinea unguium</i> (N=14)</b>		
DLSO	11	3.7%
Total dystrophic onychomycosis	3	1.0%
<b><i>Tinea manuum</i> (N=9)</b>		
Non inflammatory Squamous form	9	3.0%
<b><i>Tinea cruris</i>(N=48)</b>		
<b><i>Tinea faciei</i> (N=20)</b>		
Mixed types		
Annular type ( <i>Tinea corporis</i> ) + <i>Tinea Cruris</i>	26	8.7%
Annular type ( <i>Tinea corporis</i> ) + chronic intertriginous type ( <i>Tinea pedis</i> )	6	2.0%
<i>Tinea cruris</i> , chronic intertriginous type( <i>Tinea pedis</i> )	6	2.0%
<i>Tinea cruris</i> + Non inflammatory Squamous form ( <i>Tinea manuum</i> )	4	1.3%
Non inflammatory Squamous form ( <i>Tinea manuum</i> )+ DLSO( <i>Tinea unguium</i> )	4	1.3%
chronic intertriginous type ( <i>Tinea pedis</i> ) +DLSO( <i>Tinea unguium</i> )	4	1.3%
<i>Tinea faciei</i> + superficial type ( <i>Tinea barbae</i> )	3	1.0%
plaque type ( <i>Tinea corporis</i> ) + <i>Tinea cruris</i>	3	1.0%
Annular type ( <i>Tinea corporis</i> ) + <i>Tinea cruris</i> + DLSO( <i>Tinea unguium</i> )	3	1.0%
Psoriasis form ( <i>Tinea corporis</i> ) + <i>Tinea cruris</i>	2	0.7%
<i>Tinea faciei</i> + Inflammatory type ( <i>Tinea barbae</i> )	2	0.7%
<i>Tinea faciei</i> + circinate type ( <i>Tinea barbae</i> )	1	0.3%

positive, 27 (9%) participants had KOH negative + Culture positive, 104 (34.70%) participants had KOH positive + Culture negative and 13 (4.30%) participants had Culture + KOH negative (Table 3). Amidst the study population, 96 (32%) participants had *Trichophyton mentagrophytes*, 45 (15%) participants had *Trichophyton rubrum*, 24 (8%) participants had *Trichophyton violaceus*, and 18 (6%) participants had *Microsporum Canis* (Figure).

## DISCUSSION

The prevalence of Dermatophyte infection differs with totally divergent geographic region and weather. Despite in depth development in life science, fungal infection is the rifest disease that includes individuals of any cohort, sex and

working area and causes monumental money and emotional disturbances. Fungal infection continues to be thought-about collectively as the main public health issue in several components of the planet. The current study was conducted with 300 dermatophytosis patients who were clinically diagnosed, to study the clinical and the mycological patterns of dermatophyte infections. This study also assessed the correlation of clinical diagnosis with both culture and KOH positivity.

In the present study, the majority of the study participants were aged between 11 to 20 years (33%) followed by 21 to 30 years (26%). Our study findings were comparable with that of Singh *et al.* who have reported people in the age group of 16-30 years to be the commonly affected group by superficial dermatophyte infections.<sup>13</sup> The bulk of the literature shows a majority of the affected subjects to be in the age range of 20 to 40 years, with relatively minor proportion in the paediatric and elderly population groups. This can be

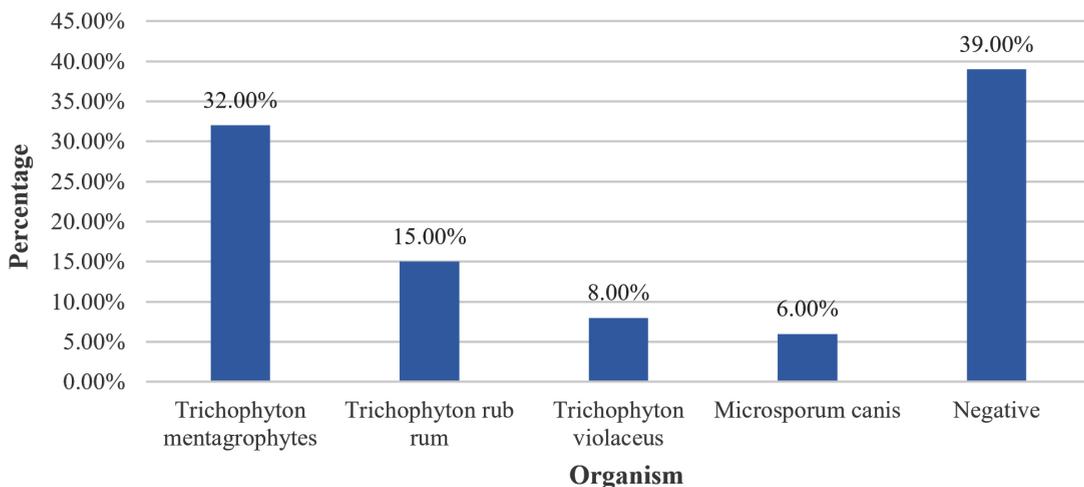
attributed to the involvement of the economically productive age groups in physical labour, often in the hot and humid environments leading to excessive sweating and wet body surfaces

The most affected population was students, this condition was because of the undeveloped immune system, progressive exhibition to in apparent suppuration carried in the home and school, incapability to sustain hygiene, which makes them prone to get current infections by Fungi. Like our study Kucheria *et al.* shown that a larger no. of patients were students (28%) and housewives (25%) followed by labourers and service class people.<sup>14</sup> But contrary to our study, Pandit *et al.* have reported that majorly 32.6% of patients were housewives followed by labours (20%) and the proportion of students was only 14%.<sup>15</sup>

In our study, 38.00% of study participants had a recurrence. Deepasri *et al.* study also reported nearly similar finding where recurrence was seen in 31.3% of cases.<sup>16</sup> There are very few studies, which have reported the recurrence of infection in the literature. There is a clear need to conduct more studies on this aspect to understand the factors associated with recurrence so that effective measures can be taken to prevent it. Improper treatment often received over the counter, inadequate treatment, poor compliance of the affected subject are the factor, which can

**Table 3.** Descriptive analysis of KOH and culture in the study population (N=300)

KOH and culture	No. of cases	Percentage
KOH positive+culture positive	156	52.00%
KOH negative+culture positive	27	9.00%
KOH positive+culture negative	104	34.70%
KOH negative + culture negative	13	4.30%



**Figure.** Percentage of Dermatophytes isolated from various clinical samples

be strongly associated with recurrence.

KOH and culture results suggest that 54% (n=156) of the cases were both KOH positive and culture positive. About 34% of the cases were KOH positive and culture negative followed by 9% showed KOH negative and culture positive results and 4.30% of the study participants showed KOH negative and culture negative results. Therefore, the present study findings were in accordance with the study findings of Deepasri *et al.* which reported that nearly 63% of the cases were both KOH positive and culture positive.<sup>16</sup>

Among the study population, type II diabetes mellitus, has been most frequent disease association, in accordance with Kucheria *et al.* study, whose findings showed that 30% of the dermatophytosis were diabetic patients.<sup>14</sup> In the present study majority proportion, 31.30% participants had *Tinea corporis*. In a study by Das *et al.*, *Tinea corporis* (21.4%), onychomycoses (14.7%) and *Tinea capitis* (6.2%) were the most common in laboratory diseases.<sup>17</sup> In a study by Maraki *et al* *Tinea unguium* followed by *Tinea pedis* were the commonly sites of dermatophyte infections in contrast to the current study findings.<sup>18</sup>

Our study findings were contrary to some of the existing studies, in Kucheria *et al.* *Trichophyton rubrum* (46.4%) was the commonest dermatophyte isolated followed by *Trichophyton mentagrophytes* (30.4%). In a study by Maraki S *et al*, *Trichophyton rubrum* was the very often segregated dermatophyte amounting 48% of the infections, continued by *Microsporum canis* (17.9%), *Trichophyton mentagrophytes* var. *interdigitale* (14.2%) and *Epidermophyton floccosum* (6%). Gupta *et al.* have reported that the very commonly isolated organism was *Trichophyton verrucosum* (35.5%).

The proportion of *Trichophyton mentagrophytes* was 30.8%, and *Trichophyton rubrum* was 20.8% to the current study findings.<sup>18,19</sup> Even though there are variations in the relative proportion of different fungi contributing to the overall dermatophyte infection, *Trichophyton rubrum* and *Trichophyton mentagrophytes* were indisputably the two common fungi responsible. Observation of the findings reported by studies from India, conducted over last 10 to 15 years

shows that *Trichophyton mentagrophytes* is gradually replacing, *Trichophyton rubrum* as the most common fungus isolated. The changing demographic profile of the affected population, changes occurring in the fungi, the pattern of drug therapies and susceptibility of fungi to them may be responsible for this changing trend.<sup>18</sup> This study provides details on the present state of the illness in a specific region. The epidemiology of dermatophytoses may alter over time. We now understand more about the mycological pattern of dermatophytoses in this area because of this study.

## CONCLUSION

There may be a geographical variation among the dispersal of dermatophyte species which are visible from studies from distinct places of India. Our study shows *Trichophyton mentagrophyte* to be the chief organism to cause dermatophytosis. A toxicological shift in the type of fungus has been perceived by so many researchers with in the era of dermatophytosis. Preliminarily, *Trichophyton rubrum* was very common organism, whereas now, *Trichophyton mentagrophytes* is isolated as the common species. This is the cause of recurrent and recalcitrant dermatophytosis. The dermatologists and different clinicians treating the dermatophyte infections has to be sensitized regarding the dynamic profile of fungi inflicting dermatophytes and acceptable ways of diagnosis and management.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## AUTHORS' CONTRIBUTION

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

## FUNDING

None.

## DATA AVAILABILITY

All datasets generated or analyzed during this study are included in the manuscript.

## ETHICS STATEMENT

This study was approved by the Institute Ethical Committee, SRM Medical College Hospital & Research Centre, India, with reference number 1138/IEC/2017.

## INFORMED CONSENT

Written informed consent was obtained from the participants before enrolling in the study.

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