

# Clinico-Mycological Study of Dermatophytic Infections in a Tertiary Care Hospital of South Delhi

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## ABSTRACT

### BACKGROUND

Dermatophytosis is a superficial fungal infection commonly referred to as ringworm or tinea. It remains a public health problem, which is prevalent in all age groups and both the sexes. The prevalence and mycological profile of dermatophytosis varies across populations and also keeps changing from time to time in a particular population. This study was conducted to study the clinico-mycological profile of dermatophytic infection in our population.

### METHODS

117 patients over a period of one year were enrolled for the study. All patients were thoroughly examined, and clinical details were noted. The sample obtained by skin / nail / hair scrapings was divided into two parts: one for KOH mount and another for fungal culture. Following direct microscopic examination with KOH, the scrapings (skin, hair and nail) were inoculated into slopes of duplicate sets of tubes containing Sabouraud's dextrose agar and dermatophyte test medium. The isolates were identified by studying the culture characteristics, pigment production, and microscopic examination of the lactophenol cotton blue mounts and slide culture.

### RESULTS

Males were found to be more commonly infected (M : F = 2.4 : 1). The most common age group affected was 16 - 30 years (49 patients, 41.8 %) followed by 31 - 45 years age group (35 patients, 29.9 %). Tinea corporis was the most common clinical presentation (54, 46.1 %) followed by tinea manuum (21, 17.9 %), tinea cruris (13, 11.1 %), tinea unguium (13, 11.1 %), tinea faciei (6, 5.1 %), tinea pedis (5, 4.2 %) and mixed (5, 4.2 %). In 52 (44.4 %) patients, KOH positivity was seen while 48 (41 %) patients showed culture positivity. The most common dermatophytes isolated were *T. mentagrophytes* (25, 59.5 %) followed by *T. rubrum* (10, 23.8 %), *T. tonsurans* (6, 14.2 %) and *Epidermophyton floccosum* (1, 2.3 %).

### CONCLUSIONS

*T. mentagrophytes* is the most common organism causing dermatophytosis in our population. An epidemiological shift of type of fungus seems to have occurred when compared to previous study in which *T. rubrum* was the most common organism isolated. Also, most common clinical pattern observed was tinea corporis followed up by tinea manuum which is different from the previously observed pattern. The present study demonstrated the clinico-mycological pattern in our population which can be utilized in framing policies and treatment guidelines.

### KEYWORDS

Dermatophytosis, Tinea, KOH, Potassium Hydroxide

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## BACKGROUND

Superficial fungal infections are worldwide in distribution. Heat and moisture play an important role in promoting the growth of these fungi, consequently leading to increased prevalence of these infections in the hot and humid regions including India. Dermatophytosis is a superficial fungal infection caused by dermatophyte, which is keratinophilic in nature and thus exclusively cause infection of skin, hair, and nails, commonly referred to as ringworm or tinea. Although not life threatening, its severity can cause great discomfort, particularly in immunosuppressed individuals. It remains a public health problem in India, prevalent in all age groups and both the sexes.<sup>1</sup>

The dermatophytes are included in three fungal genera viz., 1. *Epidermophyton*, 2. *Microsporum* and 3. *Trichophyton*. According to World Health Organization, the prevalence rate of superficial mycotic infection worldwide has been found to be 20 – 25 %.<sup>2</sup> Clinical lesions caused by the fungi are highly variable and closely resemble other skin diseases making laboratory diagnosis and confirmation necessary. The diagnostic tests include potassium hydroxide (KOH) wet mount examination, wood's lamp examination, skin biopsy and fungal culture.<sup>1</sup> The prevalence and mycological profile of dermatophytosis varies across populations and also keeps changing from time to time in a particular population. Though there are increasing reports of dermatophytoses in different tropical and subtropical countries, there is scanty data available on this issue from South Delhi. The present study was undertaken to assess the clinico - mycological profile of dermatophytic infections.

## METHODS

The study involved 117 clinically diagnosed cases of tinea attending the Dermatology outpatient department of Hamdard Institute of Medical Sciences and Research and HAH hospital, Delhi over one-year period (January 2019 to December 2019). Only untreated patients with first episode of tinea were included in the study. Detailed clinical examination including sites of involvement, body surface area involved, associated scalp, and nail involvement was conducted and recorded in a pre-designed proforma.

The suspected area was cleaned with 70 % alcohol and allowed to evaporate before collecting the specimen. Scales obtained by skin / nail / hair scrapings was divided into two parts: one for KOH mount and another for fungal culture. Direct microscopic examination was done using 10 % KOH for skin, 20 % for hair, and 40 % for nail, and fungal elements were looked for.

Following direct microscopic examination with KOH, the scrapings (skin, hair and nail) were inoculated into slopes of duplicate sets of tubes containing a) Sabouraud's dextrose agar with chloramphenicol and cycloheximide (to prevent contamination with saprophytic fungi and bacteria.), and b) Dermatophyte test medium.

One set of the tube was incubated at 37 °C and the other set at 25 °C. The cultures were examined every two days for

a period of 21 days for the presence of growth. If no growth was found after 21 days, it was considered negative for the growth of fungi. The isolates were further identified by studying the culture characteristics, pigment production, and microscopic examination of the lactophenol cotton blue (LPCB) mounts and slide culture (wherever necessary).

## RESULTS

Out of 117 clinically diagnosed patients, 83 (70.9 %) were males and 34 (29.1 %) were females (M : F = 2.4 : 1). The most common age group affected was 16-30 years (49 patients, 41.8 %) followed by 31 - 45 years age group (35 patients, 29.9 %). The least affected age group was 61 to 75 years (4 patients, 3.4 %). The youngest patient reported was 9 year and the oldest patient was 70-year-old.

Age	0 - 15 Yrs. (n = 12)		16 - 30 Yrs. (n = 49)		31 - 45 Yrs. (n = 35)		46 - 60 Yrs. (n = 17)		61 - 75 Yrs. (n = 4)	
Gender	M (n = 10)	F (n = 2)	M (n = 34)	F (n = 15)	M (n = 21)	F (n = 14)	M (n = 14)	F (n = 3)	M (n = 4)	F (n = 0)
Tinea corporis (n = 54)	4	-	15	7	11	4	9	2	2	-
Tinea manuum (n = 21)	3	1	8	2	1	3	1	1	1	-
Tinea unguium (n = 13)	1	1	5	3	2	-	1	-	-	-
Tinea cruris (n = 13)	2	-	3	2	2	-	3	-	1	-
Tinea faciei (n = 6)	-	-	-	-	3	3	-	-	-	-
Tinea pedis (n = 5)	-	-	2	1	-	2	-	-	-	-
Mixed (n = 5)	-	-	1	-	2	2	-	-	-	-

**Table 1. Age and Sex Distribution of Study Population along with the Clinical Pattern**

M- Male, F- Female

Clinical Type	KOH & Culture +ve	KOH +ve Culture -ve	KOH -ve Culture +ve	KOH & Culture -ve	Total Culture +ve	Total KOH +ve
Tinea corporis (n = 54)	13	13	6	22	19 (35.2 %)	26 (48.1 %)
Tinea manuum (n = 21)	6	3	3	9	9 (42.9 %)	9 (42.9 %)
Tinea unguium (n = 13)	3	-	2	8	5 (38.5 %)	3 (23.1 %)
Tinea cruris (n = 13)	5	1	2	5	7 (53.8 %)	6 (46.1 %)
Tinea faciei (n = 6)	1	-	1	4	2 (33.3 %)	1 (16.7 %)
Tinea pedis (n = 5)	4	-	-	1	4 (80 %)	4 (80 %)
Mixed (n = 5)	2	1	-	2	2 (40 %)	3 (60 %)
Total (n = 117)	34 (29 %)	18 (15.4 %)	14 (11.9 %)	51 (43.6 %)	48 (41.0 %)	52 (44.4 %)

**Table 2. KOH and Culture Reports in Various Clinical Patterns**

Males were affected more frequently across age groups (Table 1). Tinea corporis was the most common clinical presentation (54 patients, 46.1 %) followed by tinea manuum (21 patients, 17.9 %), tinea cruris (13 patients, 11.1 %), tinea unguium (13 patients, 11.1 %), tinea faciei (6 patients, 5.1 %), tinea pedis (5 patients, 4.2 %) and mixed (5 patients, 4.2 %). (Figure 1) (Table 1). In males as well as females, tinea corporis was the most common clinical

pattern seen followed by tinea manuum. Tinea corporis along with tinea manuum, tinea unguium, tinea cruris and tinea pedis was seen commonly in 16 - 30 years age group (22 / 49, 44.8 %), (10 / 49, 20.4 %), (8 / 49, 16.3 %), (5 / 49, 10.2 %) and (3 / 49, 6.1 %), respectively. While tinea faciei (6 / 35, 17.1 %) and mixed infection (4 / 35, 11.4 %) were seen commonly in 31 - 45 years age group. Mixed infection was seen in 5 (4.2 %) patients, which included combination of tinea corporis and tinea faciei in 2 patients, tinea manuum and tinea pedis in 2 patients and tinea manuum and tinea corporis in 1 patient.

Dermatophyte isolated	Tinea Corporis (n = 54)	Tinea Cruris (n = 13)	Tinea pedis (n = 5)	Tinea faciei (n = 6)	Tinea manuum (n = 21)	Tinea unguium (n = 13)	Mixed (n = 5)
<i>T. mentagrophytes</i> (n = 29)	11	3	2	1	6	5	1
<i>T. rubrum</i> (n = 12)	4	2	1	1	3	-	1
<i>T. tonsurans</i> (n = 6)	3	2	1	-	-	-	-
<i>E. floccosum</i> (n = 1)	1	-	-	-	-	-	-
No Growth (n = 69)	35	6	1	4	12	8	3

**Table 3. Dermatophytes Isolated from Different Clinical Types of Dermatophytosis**

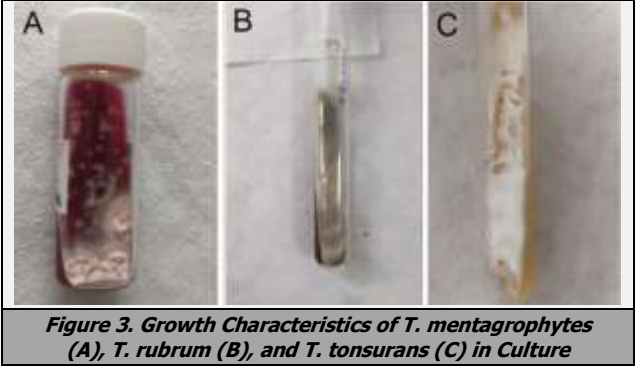
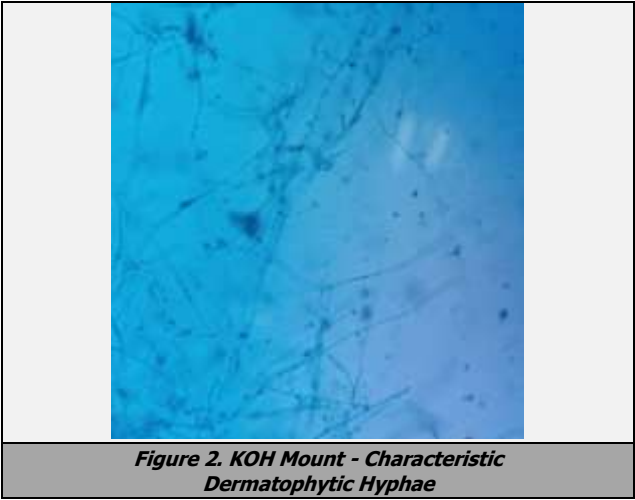


Clinical diagnosis was confirmed by direct microscopic examination (KOH) (Figure 2) and fungal culture. A positive KOH was reported in 52 (44.4 %) cases while 48 (41.0 %) patients showed culture positivity. Both KOH and culture positivity was seen in 29 % patients. KOH was reported positive in 15.4 % cases but did not yield positive cultures. Both KOH and culture negative results were seen in 43.6 % patients. A total of 11.9 % cases were negative on KOH examination while revealed growth on culture medium. (Table 2).

Out of 117 samples, dermatophytes were isolated in culture in 48 (41.0 %) patients. The most common dermatophytes isolated were *T. mentagrophytes* (29, 60.4 %) followed by *T. rubrum* (12, 25 %), *T. tonsurans* (6, 12.5 %) and *Epidermophyton floccosum* (1, 2.1 %). (Figure 3)

No organism could be isolated in 69 (58.9 %) patients. (Table 3).

In our study, a single clinical variant like tinea corporis was demonstrated to have several etiological agents; namely *T. mentagrophytes*, *T. tonsurans*, *T. rubrum* and *E. floccosum*. Similarly, single species of dermatophytes caused different clinical manifestations as seen with *T. mentagrophytes*, which was the most common isolate from all clinical types of tinea.



**DISCUSSION**

Our study included a total of 117 clinically diagnosed patients of untreated tinea. In our study, the male preponderance (70.9 %) was seen against female (29.1 %), which is in accordance with previous studies done by various authors.<sup>1,3-5</sup> This has been explained by higher involvement of males in outdoor physical activities. Another factor could be higher reporting in males, as a major part of our population came from a migrant population. The present study has revealed that majority of the dermatophytic infections have occurred in age group 16 - 30 year (41.8 %) followed by 31 - 45 years (29.9 %) i.e. 2<sup>nd</sup> to 4<sup>th</sup> decade of the life. Similar findings have been observed in study done by Surendran K et al. (44 % and 26 %, respectively) for the above age groups.<sup>6</sup> Although most of the studies have observed higher incidence in 3<sup>rd</sup> decade, the study done by Singh BS et al. showed higher incidence in age group of 21 - 30 years.<sup>7</sup> The hot and humid climate of Indian subcontinent is highly favourable for the acquisition of fungal

infection.<sup>5</sup> The exact reason for the highest incidence in young adults and low incidence in two extremes of age group i.e. children and aged persons is not known. But study done by Sumathi S et al. has suggested that it may be due to their immature immune system, enhanced exposure to subclinical infection carriers in the school or outdoors and inability to maintain hygiene.<sup>8</sup>

Tinea corporis (46 %) was the most common clinical pattern in our study which is in accordance with the previous study done by Janardhan B et al. (45 %) and Kumar K et al. (70.8%).<sup>1,3</sup> The next commonly observed clinical patterns were tinea manuum (17.9 %) and tinea cruris (11.1 %). On the other hand, Ghosh RR et al. demonstrate tinea unguium (74.5 %) as most common clinical condition followed by *T. capitis* (8.93 %) and tinea corporis (8.63 %).<sup>9</sup> In our study, prevalence of clinical patterns shows change in dermatophytic profile from the previous reported literature. This may be due to excessive use of over the counter antifungal drugs and climatic changes. Tinea corporis and tinea manuum were the common clinical patterns observed in both the sexes in our study, which may be due to symptomatic nature of the disease which leads to early seeking of medical advice by both genders.

Direct microscopy by KOH plays an important role in diagnosis of fungal infections but culture gives definite diagnosis. In our study, overall KOH positivity was 44.4 %, similar to the findings reported by Konda C et al. (51 %).<sup>2</sup> Various studies have observed variable results of KOH positivity. (Sharma R et al. 55.2 %, Mahajan S et al. 79.6 %).<sup>10,4</sup> Culture positivity in our study was 41 %, which was similar to finding observed by Singh BS et al (40 %).<sup>7</sup> Various previous studies have revealed that KOH positivity rates range from 46.8 % to 82 % while culture positivity ranges from 39 % to 58 %.<sup>2,5</sup>

Out of total dermatophytes isolated, *Trichophyton mentagrophytes* was most commonly isolated dermatophyte (59.5 %) followed by *Trichophyton rubrum* (23.8 %). Similar results were reported by Singh BS et al., Agarwal US et al. and Mahajan S et al. also.<sup>7,4,11</sup> Majority of our patients presented with multiple site involvement. No *Microsporum* species was isolated in our study. This is the common feature seen by previous studies done on dermatophytosis in India.<sup>3</sup> In studies done by Janardhan B et al., Kumar K et al. and Kucheria M et al., *Trichophyton rubrum* was the most common organism isolated.<sup>1,3,5</sup> It has been observed in the previous studies that the commonest clinical pattern in dermatophytes was tinea corporis. In the present study, it was observed that the most common organism isolated was *T. mentagrophytes* and was found to be associated with tinea corporis. Similar findings were observed by Kumar K et al., Surendran K et al. and Singh BS et al. also.<sup>3,6,7</sup>

Out of the total cases, 44% were KOH positive, 41 % were culture positive and 29 % were both KOH and Culture positive, which is in accordance with findings reported by Konda C et al. and Hanumanthappa H et al.<sup>2,12</sup> Both KOH and Culture negative results were seen in 43.58 % patients, which is in accordance with results observed by Konda C et al (45 %).<sup>2</sup> There were 11.9 % cases which were negative on KOH examination but revealed growth on culture

medium. This could have been due to presence of fungi in an inactive sporulating phase that is difficult to be seen by microscopy, but able to grow in appropriate media.<sup>2</sup>

## CONCLUSIONS

*T. mentagrophytes* is the most common organism causing dermatophytosis in our population. An epidemiological shift of type of fungus seems to have occurred when compared to previous study in which *T. rubrum* was most common organism isolated. Also, most common clinical pattern observed was tinea corporis followed up by tinea manuum which is different from the previously observed pattern. The present study demonstrated the clinic-mycological pattern in our population which can be utilized in framing policies and treatment guidelines.

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