

# Clinico-Mycological Study of Dermatophytosis in a Tertiary Care Hospital

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## Abstract

**Introduction:** Dermatophytosis is colonization by a dermatophytic fungus of the keratinized tissues like hair, nails and *stratum corneum* of the skin. Dermatophytosis is producing a dermal inflammatory response with intense itching and also of cosmetic importance. So the present study was concerned with isolation, identification and clinicomycological study of dermatophytes.

**Materials and Methods:** The study was conducted over a period of 2 years. Clinically suspected 250 cases of dermatophytosis were taken into consideration for study. Isolation and identification was done by various tests like macroscopic, microscopic and biochemical tests.

**Results:** The present study was done on 250 clinically diagnosed cases of dermatophytosis. Tinea corporis found to be the commonest clinical type with 119 cases (47.6%) followed by Tinea cruris 60(24%). Out of 250 clinically diagnosed dermatophytoses, males were more in number 168(67.20%) compared to female 82(32.8%). Out of 250 cases of dermatophytosis, 138 cases (55.2%) were positive in direct microscopic examination (KOH) and total of 106 cases (42.4%) were positive in culture. Out of total 250 clinical isolates 106 cases (42.4%) were culture positive. *Trichophyton rubrum* were the commonest isolates 69(65.09%).

**Conclusion:** This study highlighted that tinea corporis is the commonest clinical type. In *Trichophyton* species, *T.rubrum* and *T. mentagrophyte* are the most common aetiological agents and males are more frequently affected. Though various species of dermatophytes produce clinically different characteristic lesions, but a single species may produce various types of lesions depending upon site of infection.

**Keywords:** Dermatophytosis, Dermatophytes, Tinea, Trichophyton

## INTRODUCTION

Dermatophytosis refers to superficial fungal infection of keratinised tissues caused by dermatophytes. Although common, the precise size of the problem defies measurement. The present study was undertaken to assess the clinicoepidemiological profile of dermatophytic infection, to identify the species of fungi and to compare the clinical diagnosis with KOH smear positivity and culture positivity. Dermatophytosis is a colonization by a dermatophytic fungus of the keratinized tissues the nails, the hair and the stratum corneum of the skin.<sup>1,2</sup> The degree of immunosuppression and the number of immunosuppressed patients are increasing at an unprecedented pace, the management of dermatophytoses would be a definite challenge to mankind in the years to come.<sup>3</sup>

Studies on dermatophytoses in India have received increased attention in recent years because 1/5 the of the world's population suffers from mycosis.<sup>4</sup>

Fungal infection of the skin and its appendages are more prevalent in India, due to favourable climatic conditions like temperature, humidity. In India which is a tropical country, the cause of dermatophytoses is adversely influenced by economic factors like poverty, poor hygiene and social conditions like overcrowding. Nature of dermatophytoses may change with passage of time, living population, evolution of preventive measures and hygienic conditions in society.<sup>5</sup>

Dermatophytoses are generally called tineas, tinea is a Latin word for "ring worm". The second part of the name of the dermatophytosis identifies the part of the body infected.<sup>6</sup>

The dermatophytes are hyaline septate molds. These are divided into three main anamorphic genera depending on their morphological characteristics-Trichophyton, Microsporum, Epidermophyton. Based on their ecological characteristic, dermatophytes are divided into geophilic, zoophilic and anthropophilic species.<sup>7</sup>

Dermatophytosis produces a dermal inflammatory response with intense itching and also of cosmetic importance.<sup>8</sup>

So the present study was concerned with isolation, identification and clinicomycological study of dermatophytes.

## MATERIALS AND METHODS

The current study was conducted for the period of two years in the Department of Microbiology, Kasturba Medical College, Mangalore.

Clinically suspected 250 cases of dermatophytosis attending the Out Patient Department of Kasturba Medical college hospital, Wenlock hospital and Lady Goschen Hospital were studied.

After taking detailed case history, clinical examination was conducted. The patient was made to sit in the good source of light and proper clinical examination of lesion was done. It included number of lesions, types, presence of inflammatory margin, etc.

### Collection and Transport of Specimens

Proper sterilization and Aseptic condition was maintained to minimize contamination. Sufficient clinical material for direct microscopic examination and culture was collected. The following equipments were used for collection and transport of specimens: sterile nail clippers, scissors, forceps for epilation of hairs, sterile scalpel blades and curettes, sterile gauze squares, 70% alcohol for disinfection, sterile water for cleaning of painful areas and clean paper envelopes were taken to transport the clinical specimens. Black photographic paper was carried for collecting and better visualizing scrapings.<sup>9</sup>

10% KOH solution was used for skin, hair and for nail scrapings required a stronger alkali solution 20% KOH. All preparations were examined under low power and confirmed under high power.

Two sets of medium were used, Sabourauds dextrose agar (modified) and Sabourauds dextrose agar with cycloheximide and chloramphenicol were incorporated to avoid contamination with saprophytic fungi and bacteria. The clinical material were inoculated into one each of the

above two media. The inoculated agar slants were incubated in room temperature and at 37°C in incubator and observed daily for growth. If no growth was noticed by four weeks culture was considered negative and discarded.

### Macroscopic Examination of Colonies

Rate of growth, Colony characteristics was noted.

### Teases Mount Technique

A tease mount was made as soon as sufficient growth was evident on isolation medium. A small portion of the mycelium was avulsed with an inoculating wire and transferred on to a drop of Lactophenol cotton blue (LPCB) on microscopic slide. Then it was teased apart with dissecting needle. A cover slip was placed over the preparation and excess stain if any, was removed with blotting paper. The preparation was examined microscopically first under low power, then under high power objective.

### Slide Culture Technique

The fungus was sub cultured on an agar block held between slide and cover slip. This enables the arrangement a mycelium and spore to be observed undisturbed at various stages of growth.

### Urea Hydrolysis

The ability to hydrolyze urea provides additional data that can be used to aid in the differentiation of *T.rubrum* (urease negative) from *T. mentagrophytes* (typically urease positive).

### Growth on Polished Rice Grains

Unlike most dermatophytes, *M. Audouinii* grows poorly on rice grains and produces a brownish discoloration of the rice.

### In-vitro Hair Perforation Test

*T.mentagrophytes* has the ability to penetrate the hair shaft but not *T.rubrum*.

### Dermatophyte Test Medium (DTM)

DTM was used to isolate dermatophyte from a contaminated or mixed growth with other fungus and bacteria. DTM selectively inhibits bacteria and other contaminant fungi while encouraging the growth of dermatophytes. Dermatophytes produce an alkaline reaction through oxidative deamination. While most others which were capable of growing on DTM produce acid reaction.

## RESULTS

The present study for isolation, identification and clinicomycological study of dermatophytes was done on 250 clinically diagnosed cases of dermatophytosis. Out

of 250 samples isolated 215(86%) were skin scraping, 24(9.6%) were nail clipping and 11(4.4%) were hairs stubs.

Out of 250 clinically diagnosed dermatophytoses, males were more in number 168(67.20%) compared to female 82(32.8%). Highest incidence was seen in the age group 21-30 yrs with 88(35.2%) cases, followed by 31-40 yrs 71(28.4%) cases. Male to female ratio was 2.048:1 (Table 1).

Tinea corporis found to be the commonest clinical type with 119 cases (47.6%) followed by Tinea cruris 60(24%), Tinea unguium 24(9.6%), Tinea pedis 15(6%), Tinea capitis 11(4.4%), Tinea manuum 10(4%), Tinea faciei 8(3.2%), Tinea barbae 3(1.2%) (Table 2).

Out of 250 cases of dermatophytosis, 138 cases (55.2%) were positive in direct microscopic examination (KOH) and total of 106 cases (42.4%) were positive in culture. 102 cases (40.80%) were positive in direct examination (KOH) as well as culture. In 4 cases (1.6%) direct examination was negative but they were culture positive. 108 cases (43.2%) were negative in both direct examination and culture.

Sensitivity was 73.9%, Specificity was 96.4%, Positive predictive value was 96.2%, Negative predictive value was 75% (Table 3).

Out of total 250 clinical isolates 106 cases (42.4%) were culture positive. Trichophyton rubrum were the commonest isolates 69(65.09%) other isolates were Trichophyton mentagrophytes 19(17.92%), Trichophyton violaceum 4(3.78%), Epidermophyton floccosum 9 (8.49%), Microsporum audouinii 59(4.72%) (Table 4).

In 55 isolates of Tinea corporis Trichophyton rubrum isolated in 34 cases (61.82%) were the commonest isolate. Other isolates were T. mentagrophyte 12(21.82%), Trichophyton violaceum in 2(3.63%), E. floccosum 5(9.69%), Microsporum audouinii 2(3.64%).

In 35 isolates of Tinea cruris, T. rubrum were in 26 cases (74.28%) T. mentagrophyte 4(11.43%), E. floccosum 4(11.43%) Microsporum audouinii, 1 (2.85%).

In 3 isolates of T. unguium 3 isolate (60%) were T. rubrum, 2 isolates (40%) were T. mentagrophytes.

In 5 isolates from T. capitis T. rubrum was in 1 case (20%). T. violaceum 2 cases (40%), Microsporum audouinii 2 cases (40%).

T. manuum in 2 isolates, 1(50%) isolates was T. rubrum, T. mentagrophyte 1(50%). In T. faciei, T. barbae all isolates were T. rubrum (100%) (Table 5).

**Table 1: Dermatophytosis in relation to age and sex**

Age	Male	Female	Total
0-10	11 (4.4%)	9 (3.6%)	20 (8%)
11-20	31 (12.4%)	5 (2%)	36 (14.4%)
21-30	60 (24%)	28 (11.2%)	88 (35.2%)
31-40	44 (17.6%)	27 (10.8%)	71 (28.4%)
41-50	12 (4.8%)	7 (2.8%)	19 (7.6%)
51-60	8 (3.2%)	5 (2%)	13 (5.2%)
61-70	2 (0.8%)	1 (0.4%)	3 (1.2%)
	168 (67.20%)	82 (32.80%)	250

**Table 2: Clinical types of dermatophytosis**

Clinical types	Numbers of isolates	Percentage
Tinea corporis	119	47.6%
Tinea cruris	60	24%
Tinea unguium	24	9.6%
Tinea pedis	15	6%
Tinea capitis	11	4.4%
Tinea manuum	10	4%
Tinea faciei	8	3.2%
Tinea barbae	3	1.2%
Total	250	100%

**Table 3: Results obtained in the direct examination and culture**

	KOH positive (n%)	KOH negative (n%)	Total (n%)
Culture positive	102 (40.80%)	4 (1.6%)	106 (42.4%)
Culture negative	36 (14.4%)	108 (43.2%)	144 (57.6%)
	138 (55.2%)	112 (44.8%)	250 (100%)

**Table 4: Incidence of various species of dermatophytes in clinical isolates**

Species	No. of isolates	Percentage
Trichophyton rubrum	69	65.09%
Trichophyton mentagrophyte	19	17.92%
Trichophyton violaceum	4	3.78%
Epidermophyton floccosum	9	8.49%
Microsporum audouinii	5	4.72%
	106	100%

## DISCUSSION

Among the various fungal infections of human beings dermatophytes is a most common infection of the world.<sup>3</sup> Studies on dermatophytoses in India have received increased attention in recent years because 1/5 the of the world's population suffers from mycosis.<sup>4</sup>

### Age Incidence

In the present study the maximum incidence of dermatophytosis was in the age group 21-30 yrs (35.2%).

The present study was correlated with other studies which also reported predominance of cases in the age group of 21-30 year.

**Table 5: Dermatophytes in different clinical types**

	Tinea corporis	Tinea cruris	Tinea unguium	Tinea pedis	Tinea capitis	Tinea manuum	Tinea facie	Tinea barbae	Total
Trichophyton rubrum	34 (61.82%)	26 (74.88%)	3 (60%)	2 (100%)	1 (20%)	1 (50%)	2 (100%)	1 (100%)	69
Trichophyton mentagrophyte	12 (21.82%)	4 (11.43%)	2 (40%)			1 (50%)			19
Trichophyton violaceum	2 (3.63%)				2 (40%)				4
Epidermophyton floccosum	5 (9.69%)	4 (11.43%)							9
Microsporum audouinii	2 (3.64%)	1 (2.85%)			2 (40%)				5
Total	55	35	5	2	5	2	2		1

$\chi^2=44.227, P=0.0264$

Nita Patwar Dhan, Rashmika Dave et al in 1999 also reported maximum number of cases of dermatophytoses belonged to the age group 21-30 yrs.<sup>4</sup>

N Sumuna, V. Rajagopal in 2002 reported most of the cases were from age group 11-20 yr and 21-30 yr (51.4%).<sup>10</sup>

V Sumana, A Singaracharya in 2004 reported that the incidence of disease was more in the age group of 21-30 (52%).<sup>11</sup>

SS Sen, ES Rasul in 2006 in their study on dermatophytosis in Assam reported the infection was found to be the commonest in adults aged 21-30 years (44%).<sup>12</sup>

The higher incidence of dermatophyte in young age may be due to increased physical activity increased opportunity for exposure and hormonal pattern.

#### Incidence According to Sex

In the present study dermatophytic infection was more common in male (67.20%) and less common in female (32.8%). Male to female ratio was 2.04:1.

Other studies also supported the present study that incidence of dermatophyte is more prevalent in men.

KM Achary, RK Thakur et al in 1995 reported dermatophytic infection more in men (65%) and less in female (35%).<sup>13</sup>

Singh S, Beena PM in 2003 also reported in their studies dermatophytosis more common in male (61.15%) and less in female (38.84%). In their study also reported that male to female ratio was 1.57:1.<sup>14</sup>

SS Sen, ES Rasul in 2007 reported in their studies male to female ratio being 2.85:1.<sup>12</sup>

In the study done by Neetu Jain, Meenakshi Sharma, V.N. Saxena in 2008 Tinea, infection were more dominant in males (67.5%) than in female (32.5%).<sup>15</sup>

Male predominance of dermatophytosis was observed due to increased Out Door activities and increased opportunity for exposure to the fungi of men than women.

#### Culture and Microscopy

In the present study 138 cases (55.2%) were positive in direct microscopic examination (KOH). 106 cases (42.4%) were culture positive. 108 cases (43.2%) showed neither culture positive nor KOH positive. The present study was supported by other studies.

Bindu V. et al in 2002 observed in their study that in direct microscopy positivity was 64% cases and culture positivity was 45.3% cases.<sup>20</sup>

S, Singh, P.M. Beena in 2003 also reported 60.38% cases positive by microscopy and 44.6% cases were culture positive. 53.38% cases did not showed evidence of fungus either on direct microscopy or on culture.<sup>19</sup>

SS Sen, ES Rasul in 2006 reported that 4.9% cases were positive for fungal elements by direct microscopical examination, culture was positive in 51% cases.<sup>12</sup>

#### Dermatophyte Isolates

T. rubrum was the predominant isolate in the present study in 69 cases (65.09%). Other workers who reported. T. rubrum as predominant isolate in their studies, were Singh S et al in 2003 – 73.27%.<sup>19</sup> Mohanthy JC et al in 1998 – 68.34%,<sup>16</sup> Bindu V et al in 2002-66.2%,<sup>20</sup> Sumana V et al in 2004 – 60%,<sup>11</sup> Peerapur B V et al in 2004 – 43.7%,<sup>21</sup> Gupta BK et al in 1993 -42.42%.<sup>17</sup>

In the present study T. mentagrophytes was the second commonest isolate (17.92%). This correlated with the results of Bindu V et al in 2002– 25%<sup>20</sup> and Peerapur BV et al in 2004-28.1%.<sup>21</sup> Mohanty JC in 1998 reported 17.10% T. mentagrophytes in his study.<sup>16</sup> Singh S, PM Beena in 2003 reported 17.24% T. mentagrophytes.<sup>19</sup>

E. floccosum was isolated in 8.49% of cases in the present study. Singh S et al in 2003 reported - 7.75%<sup>19</sup> and Peerapur BV et al in 2004 – 7.8%<sup>21</sup> and Gupta BK in 1993 – 15.15%.<sup>17</sup>

In the present study T. Violaceum was isolated in 3.78% cases, this study was correlated with the study of Singh S et al in 2003 (1.72%),<sup>19</sup> Peerapur BV et al in 2004 (4.7%).<sup>21</sup>



In the present study *Microsporum audouinii* was isolated in 4.72% cases Peerapur BV et al in 2004 in their study reported *M. audouinii* in 6.2% clinical cases.<sup>21</sup>

### Dermatophytes Isolated in Different Clinical Types

In the present study commonest isolate 69(65.09%) were *Trichophyton rubrum* from all clinical isolates. In *T.corporis* 34 isolates (61.82%), in *T. cruris* 26 isolates (74.28%). in *T. unguium* 3 isolates (60%) were *Trichophyton rubrum*. In *T.capitis* and *T. manuum* *T. faciei*, only *T. rubrum* was isolated.

Other studies also supported the present study.

In the study done by Nita patwardhan, Rasmika Dave in 1999 commonest isolate was *T.rubrum* being (28.12%) in all clinical cases. It was prevalent in *T. corporis* and *T.cruis*.<sup>4</sup>

In study done by Seema Bhaduria, Neetu Jain in 2001 *T.rubrum* was the main isolate in all clinical types 17/50 (34%).<sup>3</sup>

In the study done by G. Venkatesan, AJA Ranjit Singh et al in 2007. *T.rubrum* was the main causative agent in *T. corporis* (45.1%), *T. cruris* (22.6%). *T. pedis* (2.8%) onychomycosis 2(2.8%).<sup>2</sup>

### Clinical Types of Dermatophytosis

#### Tinea Corporis

In the present study Tinea corporis was the commonest clinical presentation encountered in 119/250 cases (47.6%) followed by Tinea cruris (24%), Tinea unguium (9.6%) Tinea pedis (6%), Tinea capitis (4.4%). Tinea manuum (4%) Tinea faciei (32%), Tinea barbae (1.2%). Other studies also reported *T.corporis* to be the most prevalent clinical type.

G. Venkatesan, A.J.A Ranjit Singh et al in 2007 also reported in their study that tinea corporis was most prevalent (64.8%).<sup>2</sup>

Nita Patwardhan et al in 1999 reported commonest clinical type *T. Corporis* in (24.5%) cases.<sup>4</sup>

Seema Bhaduria et al in 2001 found *T.Corporis* most common clinical types in 28/70 cases (60%).<sup>3</sup>

MN Sumana and V. Rajagopal in 2002 found *T.corporis* commonest in 73/150 cases (48.66%).<sup>10</sup>

V. Sumana et al in 2004 found *T.corporis* to be the most common clinical presentation about 60% cases.<sup>11</sup>

S.S. Sen, ES Rasul in 2006 observed *T. corporis* (4.8%) being the commonest in their study.<sup>12</sup>

### T.Cruis

*T.Cruis* was the second commonest in 24% cases in the present study.

Nita Patwardha et al in 1999 reported *T.cruis* in (22.2%) cases the second commonest.<sup>4</sup>

V. Suman et al in 2004 found *T. cruris* second in (40%) cases.<sup>11</sup>

SS Sen, ES Rasul in 2006 reported tinea cruris in (19%) cases the second commonest.<sup>12</sup>

G. Venkatesh et al in 2007 found *T.cruis* second predominant in 26.8%. cases.<sup>2</sup>

### T.Unguium

In the present study Tinea unguium was in (9.6%) cases. B.K. Gupta et al in 1993 reported in (4.4%) cases,<sup>7</sup> and MM Huda et al in 1995 reported 6% incidence of tinea unguium.<sup>18</sup>

SS Sen, ES Rasul in 2006 also reported tinea unguium in (11%) cases in their study.<sup>12</sup>

### T.Capitis

In the present study *T.capitis* was reported in 4.4% cases.

Nita Patwardhan, Rashmika Dave in 1999 reported higher incidence of *T. capitis* in 12% cases,<sup>4</sup> MN sumana, V. Rajgopal 2002 also reported higher incidence of *T.capitis* in 18% cases.<sup>10</sup>

### T.Pedis

In the present study Tinea pedis was reported in 6% cases. B.K. Gupta in 1993 also reported (5.6%) cases<sup>17</sup> and M.M. Huda et al in 1995 reported in 7% cases incidence of Tinea Pedis.<sup>18</sup>

## CONCLUSION

This study highlighted that tinea corporis is the commonest clinical type. In *Trichophyton* species, *T.Rubrum* and *T. Mentagrophyte* are the most common aetiological agents and males are more frequently affected. Though various species of dermatophytes produce clinically characteristic lesions, but a single species may produce variety of lesions depending upon site of infection.

Dermatophytoses is a trivial disease but has lot of psychological effect and a costly disease in terms of treatment.

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**How to cite this article:** Sumit Kumar, P Shrikara Mallya, Pallavi Kumari. "Clinico-Mycological Study of Dermatophytosis in a Tertiary Care Hospital". *International Journal of Scientific Study.* 2014;1(6):27-32.

**Source of Support:** Nil, **Conflict of Interest:** None declared.