

## Original Research Article

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# Clinicomycological Profile of Superficial Fungal Infections Caused by Dermatophytes in a Tertiary Care Centre of North India

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## ABSTRACT

Uttarakhand has a humid climate for most of the year and also receives heavy rainfall during monsoons. Thus the environmental conditions are conducive for the development of superficial mycoses. The present study was carried out to know the prevalence of superficial fungal infection caused by dermatophytes and to speciate them which may help to control the infection. The aim of this study was to determine the prevalence of superficial fungal skin infections caused by dermatophytes, to study the clinic-mycological pattern and to speciate the isolated ones using standard mycological tests. This was a prospective study carried out over a period of one year from June 2014 to May 2015. Samples were obtained from patients who attended the dermatology department of SGRRIM&HS, Patel Nagar Dehradun. Sample included skin scraping (91.34%) followed by nail scraping or clipping (6.7%) and plucked hair (1.9%). These were subjected to direct microscopy and culture. Out of total 104 clinically diagnosed cases of superficial fungal infection, 57 (54%) samples were positive by direct microscopy and culture. 87 (83%) were culture positive out of which 40 (45.9%) grew dermatophytes and 47 (54%) grew non dermatophytes. In our study non dermatophytes grew more in number as compared to dermatophytes but the difference was not statistically significant P value 0.87. Dermatophytes are assuming greater significance both in developed and developing countries particularly due to the advent of immunosuppressive drugs and diseases like AIDS. Knowing their clinicomycological pattern may help somewhere in prevention as well as diagnosing this infection.

### Keywords

Superficial fungal infections,  
Dermatophytes,  
Tertiary care.

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## Introduction

Superficial fungal infection is the term given to infections caused by a group of fungi limited to upper layer of skin, hair and nail. Inspite of the fact that they are less dangerous or harmful for the survival of an individual, they are of importance to us because of the morbidity they cause, carry risk of person to person transmission and hence their worldwide distribution. Also a refractory superficial fungal infection may indicate an underlying immunocompromised state [1].

Along with the dramatic rise in invasive fungal infections a parallel increase in superficial mycoses has also been noted in the past decade & they have now become one of the world's most common skin diseases affecting millions of people worldwide [2].

Dermatophytes are the prevalent causes of cutaneous fungal infections. Terms "Ring worm", "tinea" or "dermatophytosis", are common terms used for infections caused by

them. Dermatophytosis is defined as the infection of the skin, hair and the nails caused by a group of closely related keratinophilic fungi called dermatophytes, all of which produce enzyme keratinase [3, 4]. Some of the factors promote dermatophytic infections like close contact with animals, use of certain drugs like antibiotics and steroids and trend of living in community [5].

The classical presentation of tinea infection is a lesion with central clearing which is surrounded by an advancing red, scaly, elevated border. This inflammation assists in colonization and may result in vesicles on the border of the affected area. The inflammation tends to be more in atopic persons and those infected with zoophilic fungi [6].

Reaction to a dermatophyte infection may range from mild to severe as a consequence of the host's reactions to the metabolic products of the fungus, the virulence of the infecting strain or species, the anatomic location of the infection, and local environmental factors [7].

The prevalence of these infections also tend to increase with age, change in geographic location and climate.

These infections are especially common in tropical countries like India due to environmental factors like heat and humidity. In addition, the risk factors include socio-economic conditions like overcrowding, poverty and neglect of personal hygiene [8]. Although mortality due to dermatophytosis has not been reported till date it does cause morbidity and hence the cosmetic importance of these infections cannot be ignored [9].

## **Materials and Methods**

### **Study population and period**

This study was conducted in department of microbiology, on samples from 104 subjects

for a period of one year from June 2014 to May 2015, presenting in skin opd of a tertiary care center of North India with clinical features suggesting of fungal skin infections after obtaining written informed consent.

## **Selection of Subjects**

### **Inclusion criteria**

All individuals presenting in skin opd with a clinical diagnosis of superficial fungal infection were included in the study.

### **Exclusion criteria**

Individuals already taking antifungal treatment were not included in the study.

### **Sample collection and processing**

The samples were collected from skin, hairs and nail from the patients, depending on the clinical condition of the patient and the suspected site of infection. The affected area was cleaned with 70% ethyl alcohol and allowed to dry. Skin scales, crusts and pieces of nail or hairs were collected in clean white paper packets. Skin lesions were sampled from the erythematous, peripheral, actively growing margins of the lesions. In case of hair samples the dull lusterless hair and stubs of hair were chosen and plucked by sterile epilator forceps, nail samples were taken from the deeper part of the discoloured or dystrophic parts of nails [3].

### **Direct microscopy**

A portion of the sample was taken on a grease-free slide for microscopy. The specimen was then subjected to potassium-hydroxide (KOH) wet preparation of various concentrations (10%, 20% and 40%) depending upon the type of clinical specimen for the presence of fungal elements. The prepared slide was later examined under low

(10 X) and high (40 X) Magnification of a simple light microscope for the presence of yeast cells, hyphae and arthroconidia. The fungal elements appear as highly refractile, hyaline septate branching filaments. [3]

## Culture

Culture was performed on Sabouraud dextrose agar (SDA) with and without chloramphenicol 50 mg/L. Pure isolates were generated by sub-culturing on Sabouraud Dextrose And Potato Dextrose Agar (PDA) media respectively for both visual and microscopic examinations of cultural (colour and growth pattern) and Morphological characteristics respectively for further differentiation. After morphological examination by microscopy, it was put on dermatophyte test media (DTM) for further confirmation. [3]

## Results and Discussion

Out of total 104 clinically diagnosed cases of superficial fungal infection, 57 (54%) samples were positive by direct microscopy and culture. 87 (83%) were culture positive out of which 40 (45.9%) grew dermatophytes [Table 1].

The 104 clinically diagnosed cases of superficial fungal infections were distributed between the ranges of 1-80 years. The most common age group to be affected was 31-40 years (28%) followed by 21-30 years (25%). Least common age group affected was 41-50 years (19%). [Table 2]. Males were more commonly affected 62 (60%) than females 42 (40%), majority of the sample included skin scraping (91.34%) followed by nail scrapping or clipping (6.7%) and least commonly, plucked hair (1.9%). In the present study most commonly affected group was of students (26%) followed by housewife (22%) and agriculture workers (18%). Majority were from low socio economic group followed by

middle socio economic group and least from high socio economic group [Table 4].

Out of a total of 104 clinically diagnosed cases of superficial fungal infections, 57 cases (54%) showed positivity in both KOH mount and culture. 12 cases (11%) were positive in KOH mount only. 27 cases (25%) showed positivity only in culture. 8 suspected cases of superficial fungal infections (7.6%) were negative both by KOH mount and culture [Table 3]. *Trichophyton mentegrophytes* was the most common isolate (24.13%) followed by *Trichophyton rubrum* (10.3%), *Microsporum gypseum*, *Microsporum canis* (3.4%). Least common isolates was *Epidermophyton floccosum* (2.3%).

In the present study, the commonest age group involved was 31-40 (28%) years and 21-30 (25%) years with males out numbering females. This age predilection has been suggested due to the involvement of this age group in outdoor activity. In addition, males do more exhaustive physical work and prolonged exposure in sun causes excessive sweating. Also the tight fittings and synthetic clothing particularly in males provide damp, sweaty and warm skin conditions. Comparable observations have been done by other authors also. [11, 12]

The lower incidence in females could be due to not paying attention to the lesion they have, as in most of the communities females do not bother about their health and they do not get enough time for reporting in hospitals due to the prevailing social stigma in rural population and poor health seeking behavior of females (12, 13). The incidence of infection are closely related to the site of infection and consequently to the clinical materials collected. In the present study skin scales represent 91% of cases, while nails account for 7% and hair 2%. Similar findings have been shown in studies from abroad also [2].

In the present study most of the cases were of students 28(26.9%) followed by housewife 23(22.1%) and agriculture workers 19(18.3%). In case of student's higher freedom of movement, carelessness, common sharing of articles by fellow students and perhaps lack of guidance regarding personal hygiene could be the factors in exposing students to increased dermatophytic infections [14]. In agricultural workers this may be due to increased physical activity and increased opportunity for exposure to plants, animals and soil [15]. A study carried out from West Bengal found that Dermatophytoses are related to activity, living conditions and age groups [16].

Higher prevalence of dermatophytic infection was seen in low income group, 62/ 104, (59.61%) followed by middle income group 34/104 (32.6%) and least common in high income group 7/ (6.73%), which is similar to the observation of Kamothi *et al.*, from Rajkot in (2010), who reported that higher prevalence of dermatophytic infection was seen in low income group than middle income

group (17). The reason behind this may be the poor living conditions, large family size and close contact, either directly or by sharing facilities, including combs and towels between family members in low socio economic people.

### Comparison of KOH mounts findings with culture findings

Out of a total of 104 clinically diagnosed cases of superficial fungal infections, 57 cases (54%) showed positivity in both KOH mount and culture. 12 cases (11%) were positive in KOH mount only. 27 cases (25%) showed positivity only in culture. 8 suspected cases of superficial fungal infections (7.6%) were negative both by KOH mount and culture. These variations between microscopy and culture have also been noted by Grover S, Roy P. from North-East India [18]. In various studies, Bindu V from Calicut, Vikesh kumar Bhatia in (2014) from Himachal Pradesh and Kamothi from Rajkot who reported that KOH positivity rate was higher than culture positivity [11, 12, 17].

**Table.1** Comparison of KOH mount with culture findings (n=104)

KOH mount	Culture		Total (%)
	Positive	Negative	
Positive	57	12	69
Negative	27	8	35
Total	84	20	104

**Table.2** Demographic distribution of subjects

Range in years	No. of cases %
1 to 10	4 (3.8%)
11 to 20	15 (4.8%)
21 to 30	26 (25%)
31 to 40	30 (28%)
41 to 50	20 (19%)
51 to 60	5 (4.8%)
61 to 70	3 (2.8%)
71 to 80	1 (0.9%)

**Table.3** Sex wise distribution of clinical types of superficial fungal infection

Type	Male	Female	Total
<b>T.corporis</b>	19 (65.5%)	10 (34.48%)	29(27.8%)
<b>T.cruris</b>	13 (54.16%)	11 (45.83%)	24 (23.0%)
<b>T.unguium</b>	5 (38.46%)	8 (61.53%)	13 (12.5%)
<b>T.capitis</b>	0 (0.00%)	2 (100%)	02 (1.9%)
<b>T.pedis</b>	11 (84.61%)	2 (15.38%)	13 (12.5%)
<b>T.faciei</b>	8 (80.0%)	2 (20.00%)	10 (9.6%)
<b>T.manuum</b>	6 (42.85%)	8 (57.14%)	14 (13.5%)
<b>T.corporis with T.cruris</b>	11 (73.33%)	4 (26.66%)	15 (14.5%)
<b>P. versicolor</b>	0 (0.00%)	3 (100%)	03 (2.8%)

**Table.4** Sample distribution according to socio economic conditions of the patients (n=104)

Socio economic status	No. of cases	Percentage (%)
Low income group	62	59.61%
Middle income group	34	32.6%
High income group	07	6.73%

**Table.5** Distribution of isolated Dermatophytic species among the clinical pattern of fungal infections

Species	T.capitis (%)	T.unguium (%)	T.faciei (%)	T.manuum (%)	T.pedis (%)	T.corporis (%)	T.cruris (%)	T.corporis with T.cruris (%)	P. versicolor (%)
<b>T.mentegrophytes</b>	0(0.0%)	2(25.0%)	2(40.0%)	3(42.8%)	3(25.0%)	4(26.6%)	5(22.7%)	2(11.7%)	0(0.0%)
<b>T. rubrum</b>	1(50.0%)	2(25.0%)	0(0.0%)	0(0.0%)	0(0.0%)	1(6.6%)	3(13.6%)	2(11.7%)	2(100%)
<b>M. canis</b>	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	1(6.6%)	1(4.5%)	1(5.8%)	0(0.0%)
<b>M. gypseum</b>	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	1(8.3%)	0(0.0%)	1(4.5%)	1(5.8%)	0(0.0%)
<b>Epidermophyton</b>	0(0.0%)	1(12.5%)	0(0.0%)	0(0.0%)	1(8.3%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
<b>Total</b>	<b>1(50%)</b>	<b>5(62.5%)</b>	<b>2(40%)</b>	<b>3(42.8%)</b>	<b>5(41.6%)</b>	<b>6(39.8%)</b>	<b>10(90.6%)</b>	<b>6(35.0%)</b>	<b>2(100%)</b>

Among dermatophytes, *Trichophyton mentagrophyte* was the predominant dermatophyte (24%) followed by *Trichophyton rubrum* (10%), *Microsporum canis* (3.4%) and *Microsporum gypseum* (3.4%), least common isolate was of *Epidermophyton floccosum* (2.3%). The difference in isolation rates of dermatophytes verses non-dermatophytes was found statistically non-significant p value=0.87.

Similar results were also reported by other workers previously from Himachal Pradesh in 2014 (19). But the findings differ in other studies from India as well as outside India, according to which *Trichophyton rubrum* was the predominant fungal pathogen than *Trichophyton mentagrophyte* (2, 17, 20). This variation is possibly due to the different geographical regions and warm climatic conditions in southern and western part of country.

Some studies have also reported about the prevalence of *Trichophyton rubrum* in chronic dermatophytosis (21), as it is a slow growing organism, so there is a possibility that other dermatophyte species might overgrow or mask the growth of *Trichophyton rubrum* while attempting isolation. (19).

*T. mentegrophytes*, the predominant species was found associated mainly with *Tinea corporis* (26.6%) and *Tinea cruris* (22.7%) however it was seen in all other *Tinea* condition except *Tinea capititis*. Similar observation have been made by authors from Himachal Pradesh in 2014, (11).

The majority of *T. rubrum* were isolated in *Tinea cruris* (13.6%) followed by *Tinea unguis* (25%) and *Tinea corporis* with *Tinea cruris* (11.7%). similar finding have been shown in other studies also (22).

*M. canis* and *M. gypseum* were isolated same in *Tinea corporis* (6.6%) followed by *Tinea cruris* (4.5%) *Tinea corporis* with *cruris* (5.8%), which is similar to findings from abroad studies (2).

*Epidermophyton* spp. were isolated in *Tinea unguis* (12.5%) and *Tinea pedis* (8.3%). Similar results were also reported by other workers previously from Bijapur (2004) (23).

The current study shows *Tinea corporis* to be the commonest clinical type of superficial mycoses followed by *Tinea cruris*, & *Tinea corporis* with *Tinea cruris*, *Tinea mannum*, *Tinea unguis* and *Tinea pedis*.

*Tinea corporis* was the most common clinical condition observed in which various exposed part of the body are affected followed by *Tinea cruris* in groin and surrounding areas are affected. Similar observation has been made by Asticciol S 2008, Bhatia & Sharma

2014, Kamothi MN 2010. This tinea condition is more common in males due to tight clothing, maceration and high rate of sweating in groin and waist region make this site more vulnerable to dermatophytosis. (24)

However certain studies conducted in North East India, West Orissa, Rajkot, indicating that many factors like selection of study groups, life style, levels of personal hygiene, climatic conditions affect the patterns and types of superficial fungal skin infections. (9) Most of the incidence of *Tinea. mannum* and *Tinea. unguis* in females has been found in our study, which may be attributed to repeated prolonged exposures to water and different types of detergents (especially in kitchen) while performing daily domestic chores. Similar findings have been shown by Bhatia and Sharma in 2014.

In our study most of the cases of *Tinea pedis* were seen in male than female cases. And our study group mainly comprised of students (26%) because of wearing of closed footwear socks and shoes for a long period in all weather. These promotes sweating and sweat retention a-milieu conducive to fungal growth. These also providing damp conditions especially in inter-digital spaces (11, 14)

After performing this study it was observed that non-dermatophyte group was involved more than dermatophyte group in causing superficial fungal infection. However considering the duration of study, we suggest that extensive research can be carried out further in a more elaborative way.

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