*Original Article*

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# Mycological Profile and Epidemiology of Dermatophytes in A Tertiary Care Hospital

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**Abstract**

*Background:* Dermatophytosis is one of the commonest superficial infections encountered in humans. Some of the non-infectious dermatological disorders resemble superficial fungal infections and should be differentiated by appropriate mycological examination.

*Aim:* To determine the prevalence, species distribution and epidemiological parameters of Dermatophytosis in patients suspected of Dermatophytosis attending Dermatology OPD of SKIMS-MC hospital.

*Settings and design:* The study was conducted in the department of microbiology at SKIMS-MC Hospital for a period of six months from July 2017 to December 2017.

*Result:* Out of 214 cases, 73 (34.12%) were positive.2 cases were KOH positive culture negative, 09 cases were KOH negative and culture positive and 56 cases were both KOH and culture positive. In addition 06cases of contaminant were observed. *Trichophyton species* was isolated in 61 (93.8%) cases and *Microsporum species was* isolated in 4 (6.1%) cases. *T. rubrum* was commonest isolate followed by *T. mentagrophytes.* Most of dermatophytic cases were seen in rural patients (74.7%) as compared to urban cases (25.2%). *M. canis* was isolated in one case of onychomycosis. Occupation wise, most cases were seen in farmers (37.7%). Tinea corporis was commonest (36.9%) body site infection followed by Tinea unguium (31.5%).

*Conclusion:* The mycological profile of Dermatophytosis may alter because of environment, socio-economic condition, profession. The epidemiological survey forms backbone for proper diagnosis and treatment. The identification of etiological agent is must for initiation of proper therapy.

**Keywords:** Dermatophytes; Mycosis; Tinea; *Trichophyton*.

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## Introduction

Superficial mycoses are among the most frequent forms of human infections, affecting more than 20–25% of the world's population.[1] They are predominantly caused by a group of closely related keratinophilic mycelia fungi (dermatophytes) in the genera of *Trichophyton*, *Microsporum*, and *Epidermophyton*. These groups of fungi invade the stratum corneum of the skin or other

keratinized tissues derived from the epidermis such as hair and nails.[2,3] Based upon their genera, dermatophytes can be classified into three groups, *Trichophyton*, *Epidermophyton,* and *Microsporum*. Based upon mode of transmission, these have been classified as anthropophilic, zoophilic, and geophilic. Based upon the sites involved, these have been classified clinically into Tinea capitis, Tinea faciei, Tinea barbae, Tinea corporis, Tinea manuum, Tinea cruris, Tinea pedis, and Tinea unguium. Other clinical variants include Tinea imbricata, Tinea pseudoimbricata, and Majocchi granuloma. Dermatophytes have been recorded all over the world but with variation in distribution, incidence, epidemiology, and target hosts from one location to another. Geographic location, climate, overcrowding, healthcare, immigration, environmental hygiene and socioeconomic conditions have been incriminated as major factors for these variations.[1,4] *Trichophyton rubrum* continues to be the most common isolate with Tinea corporis and Tinea cruris the most common clinical presentation. Tinea corporis is one of the common kinds of dermatophytosis which is prevalent all over the world and sometimes involves 22% of all dermatophytosis.

## Material and Methods

The study was conducted on Patients, referred from Department of Dermatology SKIMS Medical College Hospital to Department of Microbiology SKIMS Medical College for fungal studies.

A total of 214 patients with clinical features suggestive of fungal infection were included in the study. All samples were subjected to KOH mount and fungal culture. Nail clippings, Skin scrapings & hair samples were collected as follows.

***Nail clippings:*** The samples were taken from the proximal and lateral edges of the nail. A large nail cutter (nail pliers or nipper for thick toenails), scalpel blade for scraping nail plate and a spoon excavator or any small blunt instrument (used in pedicure) were used for collection of subungual debris. Nail specimens were cut about 2 to 3 mm thickness. Once collected, nail specimen were kept in Petri dishes or small black sterile paper.[5,6]

***Skin scrapings:*** Lesions were wiped with 70% alcohol. Margin of the lesion were scrapped with a sterile scalpel. The scrapings were placed in sterile black paper.

***Hair sample[7]:*** With the help of forceps, at least 10 hairs (epilate) were pullout. Dull broken hairs from the margin of the lesion were plucked using sterile tweezers.

***Scalp sample:*** The affected area was cleaned with 70% alcohol. Using a blunt edge of scalpel area showing margins of inflammation were scrapped.

***Processing of samples:*** The sample was kept in 10% KOH with DMSO for a variable duration ranging from 5 minutes to 30 minutes, depending upon the thickness of the scales and examined every 5 minutes. Nail clippings were placed in a test tube containing 20% KOH with DMSO and the tubes were incubated 1 to 2 hours.

***Fungal culture*:** The samples were inoculated on Sabouraud dextrose Cycloheximide Chloramphenicol Agar.[8] The slants were incubated at 25°C & observed for any growth at interval of three days, any slant showing no growth at 4 weeks were considered negative.

***Macroscopic examination:***[9] The growth on agar slants was examined to study the colony morphology based on following characteristics. On obverse for colour and consistency and on reverse for the presence or absence of pigment, whether diffusing or not.

Microscopic examination was done on small portion of colony after placing in 1 or 2 drops of mounting fluid (LPCB) on a slide with two teasing needles and coverslip was placed over and slide was examined under microscope (10X × 40X) for shape & arrangement of conidia.

***Slide Culture:*** When reproductive structures were seen, the culture was harvested. The coverslip is removed and mounted on a slide with 1–2 drops of LPCB. Slides were examined for shape & arrangement of conidia.

***Urea Hydrolysis test:*** Tube of Christensen's urea agar slants were inoculated with the growth & tubes were incubated at 25–30°C for 8 days. The slants were observed every 2–3 days for a color change. Uninoculated tubes were put as negative controls

## Results

The study was conducted in the Department of Microbiology Sher-i-Kashmir Institute of Medical

Sciences Medical College (SKIMS-MC) Bemina, Srinagar Kashmir from July 2017 to December 2017. It was a prospective study in which total number of 214 cases suspected of dermatophytosis were studied.

The maximum numbers of cases were seen in age group of 4–14 years and 31–50 years. The significant number of Dermatophytosis was noted in rural population (74.7%) as compared to urban population (25.2%). The *Microsporum canis* was isolated in one case of onychomycosis which is very rare.

Out of 214 patients, 104 (48.6%) were female patients and 110 (51.4%) were male patients. *T. rubrum* was the predominant species 50% found in male as well as 50% in female patients followed by *T. mentagrophytes* which was 66.6% in males and 33.3% in females, followed by *T. violaceum* which was predominant in females 57.1% than males 42.8%. There was only one isolate of *T. schoenleinii* isolated from male while no isolate of *T. schoenleinii* found in females, while as *Microsporum canis* was equally distributed in males and females (Table 1, Fig. 1)

**Table 1:** Distribution of positive patients and species isolated according to gender.

| Total samples | Total positive | Positive males | Positive females |
|---|---|---|---|
| 214 | 73 (34.12%) | 38 (17.7%) | 35 (16.35%) |
| *Trichophyton rubrum* | 32 | 16 | 16 |
| *Trichophyton mentagrophyte* | 21 | 14 | 7 |
| *Trichophyton Violaceum* | 7 | 3 | 4 |
| *Trichphytonschoneilli* | 1 | 1 | 0 |
| *Microsporum canis* | 4 | 2 | 2 |

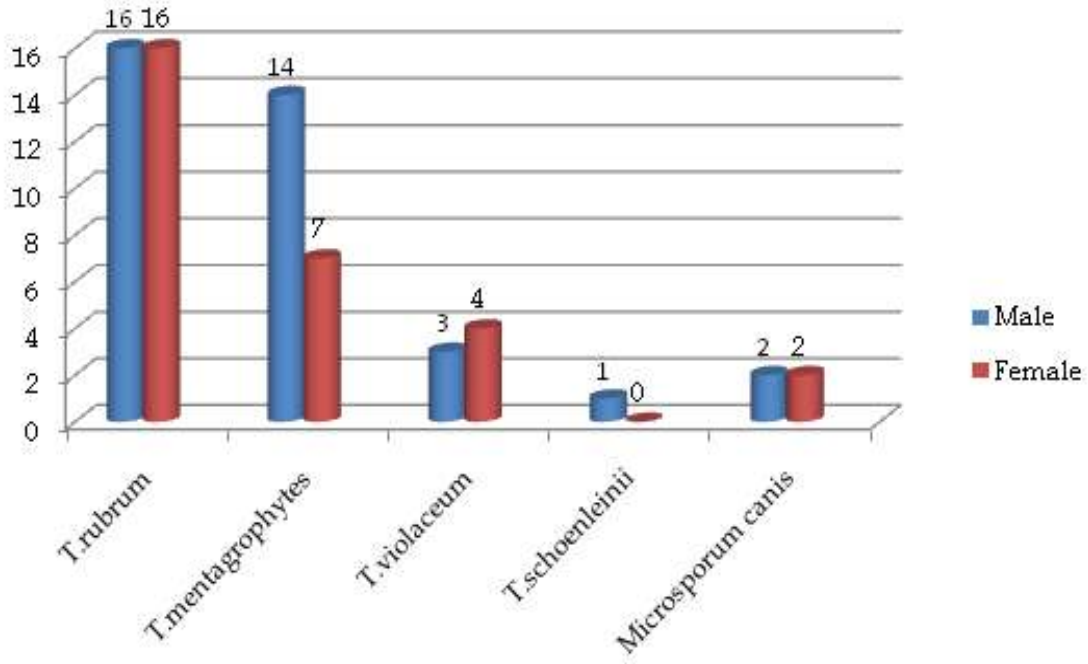


**Fig 1:** Distribution of species according to gender

The maximum number of positive cases were seen in Farmers (37.7%) followed by homemakers and student (Table 2).

*Trichophyton rubrum* was commonest species isolated followed by *Trichophyton mentagrophytes* (Table 3) Most of isolates of Dermatophytes were from cases of Tinea corporis and Tinea unguium (Table 3)

**Table 2:** Occupation wise positivity

| Occupation | Total | Positive | Percentage |
|---|---|---|---|
| Office worker | 17 | 5 | 29.4% |
| Student | 82 | 25 | 30.4% |
| Home maker | 52 | 18 | 34.6% |
| Farmer | 45 | 17 | 37.7% |
| Miscellaneous | 18 | 08 | 44% |

**Table 3:** Distribution of species isolated according to site of involvement.

| | Distribution of Species | | | | |
|---|---|---|---|---|---|
| **SITE** | ***T. rubrum*** | ***T. mentagrophytes*** | ***T. violaceum*** | ***T. schoenleinii*** | ***M. canis*** |
| *T. corporis* | 12 | 05 | 01 | 01 | 02 |
| *T. unguium* | 12 | 08 | 00 | 00 | 01 |
| *T. pedis* | 01 | 01 | 00 | 00 | 00 |
| *T. capitis* | 03 | 02 | 06 | 00 | 01 |
| *T. faciei* | 03 | 01 | 00 | 00 | 00 |
| *T. barbae* | 00 | 02 | 00 | 00 | 00 |
| *T. cruris* | 01 | 02 | 00 | 00 | 00 |

There were two cases of KOH positive and culture negative while 9 cases of KOH negative and culture positive (Table 4).

Out of 65 culture positive patients, 18 (27.6%) were already on antifungal therapy and 06 (9.2%) patients were on topical steroid therapy (Fig. 2).

**Table 4:** Results of microscopy & culture.

| Total number of positive including contamination | Positive by KOH & Culture | KOH positive Culture Negative | KOH negative culture positive | Contamination of culture |
|---|---|---|---|---|
| 73 | 56 (76.7%) | 02(2.7%) | 09(12.3%) | 06 (8.2%) |

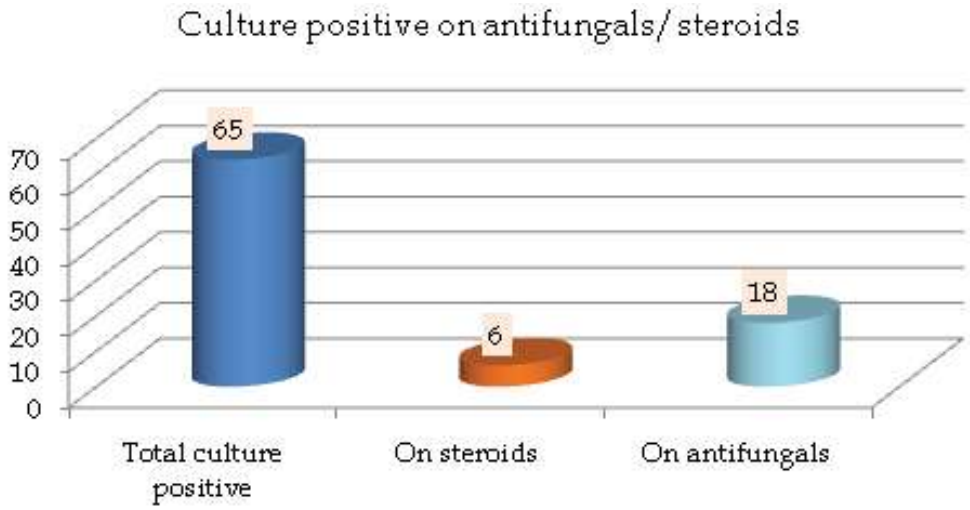


**Fig 2:** No. of patients showing growth despite on treatment.

## Discussion

Dermatophytosis has become one of the most common human infectious diseases in the world and is cosmopolitan in distribution. The epidemiology of superficial fungal infections has changed significantly in the last century and reflects changes in socioeconomic conditions, lifestyle, and other changes like migration.[10]

In the present study, out of 214 specimens only 73 (34.1%) samples were positive by direct examination and/or culture. In various studies, KOH positivity rate varied from 35.6% to 88.6% and rate of culture positivity varied from 36% to 53.6%.[11,12] In our study, direct microscopy was positive in 58 (27.1%) cases out of214 and culture was positive in 65 (30.3%) cases out of 214 cases. There were only 56 (76.7%) samples out of 73 positive samples which were positive by both, 2 samples (2.7%) which were positive by KOH but culture negative and 9 samples (12.3%) were KOH negative but culture positive suggestive of higher sensitivity of culture. The results were in accordance with the findings of study which was carried by Manjunath Shenoy *et al*., which showed positive results in 53% and 35% cases by direct microscopy and culture respectively. However, in the study which was conducted by Das *et al*., direct microscopy was positive in only 32.94% cases, while culture were positive in 49.4% cases.[13]

In the present study more positive cases were seen in males (17.7%) as compared to females (16.3%) which may be statistically insignificant in our study. How over male preponderance has been found in other studies.[8]

In the present study persons of all age groups were susceptible to dermatophytosis but it appeared to be more common in the age group 4–14 years accounting for 53.6% of the cases, findings are compatible with other studies.[14,15]

In this study *Trichophyton* constituted 61 (93.8%) and *Microsporum* 4 (6.1%) only, no case of *Epidermophyton* was documented. Among the *Trichophyton* genera the majority of case showed *T. rubrum* species 32 (49.2%). Several reports from India and abroad also show *Trichophyton* as the commonest genus and *T. rubrum* the commonest species.[16] Our finding was close to two other studies which showed an isolation rate of *T. rubrum* as 43.7% and 42.3%.[15] In this study we have obtained 21 (32.3%) isolates of *T. mentagrophytes* and is second most common isolate. This finding is in concordance to the previous studies, *Microsporum* and *Epidermophyton* account for smaller percentage of infections compared to *Trichophyton* genus in various studies. We observed that *T. rubrum* was the most preponderant isolate from T. corporis (12/21). This finding is similar to many other reports.[16] In this study, Tinea capitis was found to be more common in males 8 (66.6%) than females 4 (33.3%), which is similar to the results of other studies, including an earlier study done in Kashmir.[17] Regarding the etiology of Tinea capitis, *T. violaceum* was the most common agent followed by *T. rubrum* and *T. mentagrophytes* among other strains. This is in concordance with other studies, where *T. violaceum* was found to be the most common causative agent.[18] In this study, *M. canis* was isolated from a case of onychomycosis which is very rare, but have been reported in some studies.[19] However, onychomycosis due to *Microsporum species* has not been reported from our geographical region.

The maximum number of patients of dermatophytosis was found from rural population (71.2%) of Kashmir and most of the patients were labourers and farmers. The results of the present study indicate that dermatophytosis is the most common skin disease in the rural population of Kashmir. It was observed that the living condition of the patients played a major role. Almost all the patients belonged to lower economic group with occupations as daily wage labourers and farmers which are in close contacts with animals and soil. In our study, there were 18 (27.6%) patients on antifungal therapy but showed the growth on the culture suggesting the infecting strain could be drug resistant. Studies around the world are noticing an increasing rise in resistance to common antifungal drugs.[20,21]

## Conclusion

A good percentage of cutaneous afflictions are due to superficial fungal infections. In general, the estimated prevalence of these conditions varies with respect to age, gender & occupational groups. KOH with DMSO constitute main stay in the diagnosis of dermatophytosis however culture helps to identify the genus & species affecting the patient hence is more scientific and with some clues of resistance among dermatophytes, future demands culture and sensitivity of the fungi may be essential with species identification. With the insight in to the epidemiological, demographic and other biological characteristics of various dermatophytes the probability of the prevention becomes brighter. Although the sample size in our study was small ($n$=214) however, it reflects the mycological profile of the cutaneous dermatophytosis in our hospital setting. It also gives a rough estimate of prevalence, gender distribution, age distribution, diagnostic methods and advantages of the culturing the dermatophytes.

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