

Clinico-mycological aspects of dermatophytes against tinea infection from patient attending tertiary care hospital: A study from Himalayan region, Uttarakhand



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ABSTRACT

Background: Superficial fungal skin infections are quite common and affect millions of people in the world over. Dermatophytes are the most common causative agents of these superficial fungal infections. There has been an increasing trend and changing pattern of dermatophytosis, in Garhwal region, Uttarakhand.

Aims and Objectives: This study was aimed to identify the clinical and mycological profile of dermatophytes infection from clinical sample in Uttarakhand, India.

Materials and Methods: Dermatophytes suspected samples from patients were examined according to standard mycological protocols such as potassium hydroxide mount and Sabouraud's dextrose agar (SDA) culture. Causative organisms were identified by macroscopic and microscopic examination after growth on SDA (with or without cycloheximide and chloramphenicol) and confirmed by lactophenol cotton blue mount, slide culture technique, and biochemical test. **Results:** Out of 652 clinical samples, 96 (14.7%) samples showed positive fungal culture. Among these 96 positive fungal cultures, 65 (67.7%) were dermatophytes (predominantly isolates were *Trichophyton mentagrophytes*) and 31 (32.3%) were non-dermatophytes (including *Aspergillus* spp., *Candida albicans* and Non-*albicans Candida* species. Male predominance was found among the patients being 1.5:1 (male: female) ratio.

Conclusion: Among the dermatophytic infections, *T. mentagrophytes* was found to be predominant isolate in Garhwal region, Uttarakhand.

Key words: Tinea infection; Dermatophytes; *Trichophyton mentagrophytes*

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INTRODUCTION

Superficial fungal skin infections are quite common and affect millions of people the world over. Dermatophytes are the most common causative agents of these superficial fungal infections with an estimated 10–20% lifetime risk of acquiring one. Dermatophytes are a group of closely related fungi with three different genera (*Trichophyton*, *Microsporum*, and *Epidermophyton*) that produce a skin infection in humans, called dermatophytosis, commonly referred to as ringworm or tinea infection. These species are further classified as

geophilic, zoophilic, or anthropophilic based on whether they predominantly reside in the soil, on animals, or on humans, respectively.¹⁻³ Since the infections caused by fungi are often confused with other skin disorders, it is therefore necessary to make an early laboratory diagnosis for better patient management. The diagnosis of Tinea corporis is mostly clinical, though it is prudent and essential to perform laboratory testing of infected cutaneous tissues which include direct microscopy of the specimen in 10% potassium hydroxide (KOH) solution and fungal culture in Sabouraud's dextrose agar (SDA) medium.

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Aims and objectives

Aim and objective-this study was aimed to identify the clinical and mycological profile of dermatophytes infection from clinical samples in Uttarakhand, India.

MATERIALS AND METHODS

This prospective study was conducted in the Department of Microbiology at VCSGGIMS and R, Srinagar Garhwal, Uttarakhand, India. A total of 652 non-duplicate clinically suspected tinea infection cases were processed from July 2023 to June 2025.

Clinically suspected cases of superficial mycosis that provided informed consent were included in the study. This study excluded those patients who are on systemic antifungal treatment during past 1 month duration or on topical antifungal treatment, and those who were not providing informed consent. Repetitive samples were also excluded from the study. The study was conducted after obtaining ethical clearance from the Institutional Ethics Committee VCSGGIMS and R, bearing letter number (MC/IEC/2022-2023/85).

Skin scrapings, hair plucking, and nail clipping samples were received in the Department of Microbiology for processing as per standard protocol. The specimens were subjected to KOH wet preparation using 10–20% KOH for skin and hair, and 40% for nail; for the presence of fungal elements. The specimens were inoculated into SDA without antibiotic and SDA with antibiotics- chloramphenicol and cycloheximide (HiMedia, Mumbai, India). The inoculated culture media were incubated at 25°C and 37°C and examined daily for the 1st week and every alternate day thereafter up to 4 weeks for evidence of fungal growth. If no growth was obtained after 4 weeks, it was taken as negative for the growth of fungus. The fungal isolates obtained were identified, based on colony morphology, pigmentation, growth rate, microscopically by lactophenol cotton blue mount, slide culture, and urease test.⁴

RESULTS

Out of the suspected 652 clinical samples, 96 (14.7%) were positive for fungal hyphae by KOH mount examination. Among these 96 positive fungal hyphae findings, 65 (67.7%) dermatophytes were culture positive and 31 (32.3%) were non-dermatophytes. Among the 652 fungal suspected samples, 31–40 years of age group was the maximum in the study.

Table 1 shows majority of patients with suspected superficial fungal infections in the age group of 31–40 years (19%), followed by age group of 41–50 years (18.3%). Patients with culture-confirmed dermatophyte infections were reported most commonly in 41–50 years of age group, that is, 15 (23.1%) which is followed by 31–40 years of age group, that is, 14 (21.5%). Moreover, the superficial fungal infections were predominant in male 392 (60.1%) as compared to female 260 (39.9%), as shown in Table 1.

As shown in Table 2, out of a total of 652 clinically diagnosed cases of superficial fungal infections, 49 (7.5%) cases showed positivity in both KOH mount and culture. About 47 (7.2%) cases were positive in KOH mount only. About 16 (2.5%) cases showed positivity only in culture. About 540 (82.8%) suspected cases of superficial fungal infections were negative in both KOH mount and culture.

Among 96 KOH mount positive cases, dermatophytes and non-dermatophytes were obtained in 65 and 31 samples, respectively, as shown in Table 3. There were 65 clinical isolates of *Trichophyton* species out of suspected 652 clinical samples, that contributes 9.97%. These *Trichophyton* species consist of 41(63%) *Trichophyton mentagrophytes* isolates, followed by 08 (12.3%) *Trichophyton rubrum*, 7 (10.8%) *Trichophyton tonsurans*, 5(7.6%) *Trichophyton violaceum*, 3(4.6%) *Trichophyton verrucosum*, and 1 (1.5%) *Microsporum distortum* as shown in Table 3, Figures 1-3.

Among non-dermatophytes, the most common isolate was *Aspergillus* species 13(13.5%); followed by *Candida albicans*

Table 1: Age/sex wise distribution of study population

Age (in years)	Male	Female	Total (n%), where n=652 (%)	Total (n%), where n=65 positive findings of dermatophytes (%)
1–10	14	13	27 (4.1)	3 (4.6)
11–20	45	29	74 (11.4)	7 (10.8)
21–30	68	45	113 (17.3)	10 (15.4)
31–40	76	48	124 (19.0)	14 (21.5)
41–50	72	47	119 (18.3)	15 (23.1)
51–60	50	40	90 (13.8)	7 (10.8)
61–70	46	26	72 (11.0)	6 (9.2)
71–80	16	8	24 (3.7)	2 (3.1)
>80	5	4	9 (1.4)	1 (1.5)
Total	392	260	652 (100)	65 (100)



Figure 1: Tinea infection: (a) tinea capitis, (b) Tinea faciei, (c) KOH mount positive

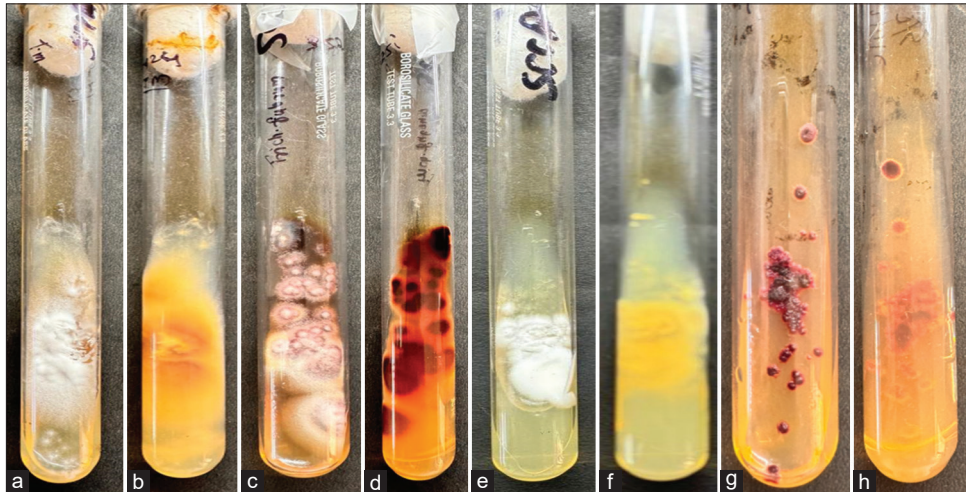


Figure 2: Sabouraud's dextrose agar picture: (a and b) *Trichophyton mentagrophytes*: obverse view: Flat, creamy, and granular surface, reverse view: Tan yellow; (c and d) *Trichophyton rubrum* obverse view: Flat, creamy, and downy surface, reverse view: Red pigmented; (e and f) *Trichophyton tonsurans* obverse view: Wrinkled colony, reverse view: Tan yellow/brown; (g and h) *Trichophyton violaceum* obverse view: Ray-colored heaped up colony, reverse view: Red/brown pigment, respectively, left to right

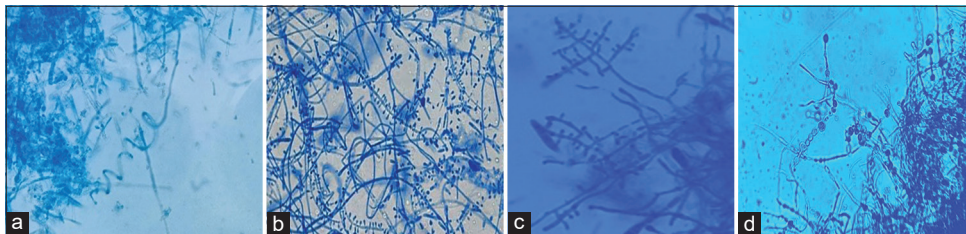


Figure 3: Lactophenol cotton blue mount: (a) *Trichophyton mentagrophytes* (club-shaped microconidia with spiral hyphae), (b) *Trichophyton rubrum* (microconidia birds on fence and pencil-shaped macroconidia), (c) *Trichophyton tonsurans* (intercalary and terminal chlamydoconidia with matchstick microconidia), (d) *Trichophyton violaceum* (irregular, tangled hyphae, with chain of chlamydoconidia)

Table 2: Comparative KOH mount and culture findings on SDA

KOH mount	Culture		Total (n%) (%)
	Positive (%)	Negative (%)	
Positive	49 (7.5)	47 (7.2)	96 (14.7)
Negative	16 (2.5)	540 (82.8)	556 (85.3)
Total (n=652)	65 (10)	587 (90)	652 (100)

SDA: Sabouraud's dextrose agar, KOH: Potassium hydroxide

4(4%), non-*albicans* species 6 (6.2%), *Penicillium* spp. 4 (4%), *Alternaria* spp. 2 (2%), and *Exophiala* spp. 2 (2%), as shown in Figure 4.

Thus, *T. mentagrophyte* was the predominant isolates from *T. corporis*, followed by tinea cruris infection. From tinea capitis, the most commonly isolates were *T. violaceum*, as shown in Table 3.

DISCUSSION

Superficial mycoses of the glabrous skin are among the most prevalent of human infectious diseases seen in clinical practice. Prevalence of superficial fungal infections may vary with lifestyle and population migration patterns, and climatic conditions. They can be caused by dermatophytes

Clinical manifestations	<i>Trichophyton mentagrophyte</i> (%)	<i>Trichophyton rubrum</i> (%)	<i>Trichophyton tonsurans</i> (%)	<i>Trichophyton violaceum</i> (%)	<i>Trichophyton verrucosum</i> (%)	<i>Microsporum distortum</i> (%)	Total (%)
Tinea corporis	16 (24.6)	2 (3)	5 (7.7)	0	0	1 (1.5)	24 (36.9)
Tinea capitis	0	0	0	4 (6.1)	0	0	4 (6.1)
Tinea cruris	20 (30.7)	2 (3)	1 (1.5)	0	0	0	23 (35.4)
Tinea faciei	2 (3)	1 (1.5)	0	0	1 (1.5)	0	4 (6.1)
Tinea manuum	1 (1.5)	1 (1.5)	0	0	0	0	2 (3)
Tinea pedis	1 (1.5)	1 (1.5)	0	1 (1.5)	1 (1.5)	0	4 (6.1)
Tinea unguium	1 (1.5)	1 (1.5)	1 (1.5)	0	1 (1.5)	0	4 (6.1)
Total	41 (63)	8 (12.3)	7 (10.8)	5 (7.6)	3 (4.6)	1 (1.5)	65 (100)

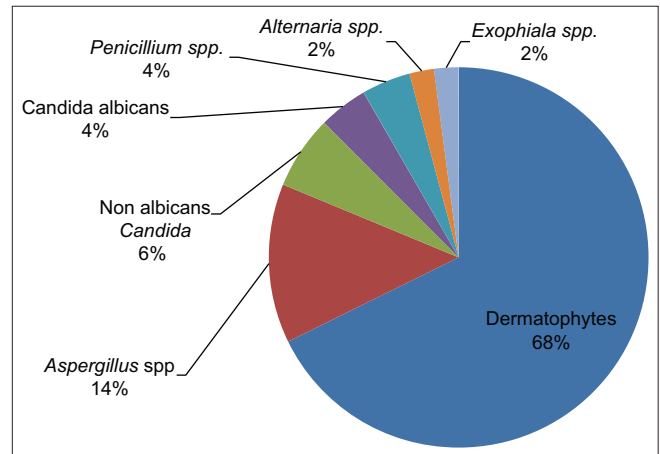


Figure 4: Non-dermatophytes fungal isolates obtained from various samples suspected with superficial fungal infection

and non-dermatophytes species. Dermatophytosis is a widely prevalent infection in Northern India due to favorable environmental and climatic conditions.

This study shows that the *T. mentagrophytes* was the predominant species associated mainly with *T. corporis* (26.6%) followed by *Tinea cruris* (22.7%); however, it was seen in all other tinea condition except tinea capitis in which *T. violaceum* was predominant, as shown in Table 3 and Figure 1. Most *Trichophyton* species affected skin, hair, and nail. *T. mentagrophytes* was most commonly isolated from skin and nail, followed by *T. violaceum* from hair and *Microsporum distortum* from skin specimen.

Similar findings of predominant isolates of *T. mentagrophytes* among dermatophytes were reported by Negi et al., in 2017, from Dehradun that contributed 24%,⁵ a study done in Karnataka by Noronha et al., in 2016 showed 48.3% isolates.⁶ In 2018, Devrari et al., in Mangalore showed 39.2%,³ and a study done by Bhatia and Sharma in 2014 at Himachal Pradesh showed 63.5% isolates.⁷ In 2016, a study in Maharashtra was done by Putta et al.,⁸ and showed that the most common isolates were *T. mentagrophytes* that contributes 37.74% followed by *T. rubrum* as 24.53%; and the study done by Tokbipi et al., in 2019, found that most prevalent isolates were also *T. mentagrophytes*, that contributes 28.9%.⁹

However, a study done in and around Shimla Hills by Bhagra et al., showed discordant findings in this regard where *T. rubrum* (66.17%) was most prevalent, followed by *T. mentagrophytes* (19.11%) and *T. verrucosum* (2.94%).¹⁰

The present study shows that most clinical diagnosed cases of dermatophytes from *T. corporis* (36.9%) and tinea cruris (35.4%); similar to the study done by Surendran et al., where *T. corporis* was the most common clinical infection

(44.3%), followed by tinea cruris (38.2%). In the same study, *T. rubrum* was the predominant isolates (67.5%), followed by *T. mentagrophytes* (20%), which is not similar to the present study.¹¹

In the present study, the majority of the patients were male in this study, that is, 392 (60.1%), and female was 260 (39.9%). It could be due to their more involvement in agricultural activities, hot and humid conditions.

Limitations of the study

We could not perform the antifungal susceptibility testing due to resource constraint's.

CONCLUSION

This study highlights the causative agents of tinea infection in Himalayan region of Uttarakhand. The overall positivity by culture isolates *T. mentagrophytes* 41 (63%) that was the most frequently isolates of dermatophytes in this region.

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Author's Contribution:

SG- Involved in literature survey, data collection, data analysis, manuscript preparation; **JCD-** Involved in literature survey, data analysis, manuscript preparation, and submission of article; **DD-** Involved in guidance of clinical protocol and manuscript review; **VR-** Involved in guidance of clinical protocol, data analysis, manuscript review, and editing.

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