

ORIGINAL ARTICLE

Epidemiological, Clinical and Mycological Profile of Dermatophytic Infections: A Cross-Sectional Study in Tertiary Care Hospital

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Abstract:

Background: Superficial fungal infections of skin, hair and nail due to dermatophytes are known as dermatophytosis. The sudden increase in the incidence of dermatophytosis in India poses an enormous challenge to healthcare professionals. The prevalence of the disease and the associated environmental factors needs to be evaluated further. There is a need for well-designed studies about dermatophytosis scenario in India. **Aim and Objective:** This study was aimed to determine the prevalence, etiological agents and clinical patterns of dermatophytic infections among the patients attending a tertiary care hospital in Pune. **Material and Methods:** It was a hospital based cross-sectional study conducted on 105 patients attending a tertiary care hospital over a period of 12 months. Detailed history was obtained from patients included in the study. They were subjected to a clinical examination and investigations including a skin scraping for Potassium-hydroxide (KOH) mount for direct microscopic examination and culture for species identification. **Results:** Maximum patients belonged to age group 21-30 years (38.09%); males (60.95%) were more commonly affected than females (39.05%). Family members of about 36% patients had history of dermatophytosis. Diabetes mellitus was most common association seen in 5.71% patients. Tinea cruris (31.67%) was the most common clinical pattern followed by tinea corporis (28.5%). KOH positivity was seen in 74.20% and culture positivity was seen in 43.89% of total samples collected. Out of 105 patients, only 42.85% patients showed growth of organisms on culture media, out of which Trichophyton mentagrophytes was the most common species isolated seen in 42.22% patients followed by Trichophyton rubrum in 31.11% patients. **Conclusion:** Dermatophytosis is more common in young males. There is a chance of infection spreading amongst the family members so counselling during the first visit of the

patient regarding lifestyle modification, and treatment compliance is very important for better clinical outcome. Species identification may help epidemiologically but it is a non-sensitive test for the diagnosis of dermatophytosis.

Keywords: Trichophyton, Potassium-hydroxide, Mentagrophytes, Dermatophyte.

Introduction:

About 20-25% of the world's population is infected with dermatophytoses [1]. Dermatophytosis refer to superficial fungal infection of keratinised tissues caused by Trichophyton, Microsporum and Epidermophyton species. Dermatophytosis are also referred to as "tinea" infections. They are named according to site of infection. It is more prevalent in tropical and subtropical countries like India where the heat and humidity are high for most part of the year. It is also influenced by factors like poverty, poor hygiene and overcrowding [2].

These infections are caused by dermatophytes that are capable of growing by invading the keratin of skin, hair and nail for obtaining nutrients by producing proteases that digest keratin and allows colonization. Thus, these fungi do not infect mucosal surfaces. The severity of the dermatophytosis depends on the strain of the infecting dermatophyte, the sensitivity of the host, and the site of infection [3]. Dermatophytes are classified depending upon their primary habitat in to three groups anthropophilic, zoophilic and geophilic. Human infection can be caused by species of all three groups [4]. Potassium hydroxide (KOH) microscopy is used to confirm the diagnosis of dermatophyte infection by

directly visualizing hyphae. Also Wood's lamp examination, skin biopsy, nail biopsy and fungal culture can be used for diagnosis of dermatophyte infection.

The main objective of this study was to determine the prevalence of dermatophytosis, their etiological agents and clinical patterns.

Material and Methods:

This was a cross-sectional study conducted on 105 patients having dermatophytic infection who attended outpatient department of dermatology in a tertiary care hospital at Pune over a period of 12 months from 1st January 2018 to 31st December 2018. This study included 105 patients with clinically suspected dermatophytosis from age 5 to 60 years, out of which 64 were males and 41 were females. Patients who were not willing to give informed consent to participate in the study were excluded. Patient who had history of either oral corticosteroid intake or topical corticosteroid application over past 3 months were excluded from the study. After obtaining institutional ethical committee approval, 105 patients were enrolled in the study.

All the patients were enrolled in the study after taking written informed consent. A detailed history of all the patients was taken regarding age, sex, address, duration of illness, previous history of either oral corticosteroid intake or topical corticosteroid application, history of similar complaints in family, sites of involvement, recurrences, immunocompromised conditions like diabetes mellitus and HIV. General physical examination and systemic examination was conducted and investigations like blood sugar levels and ELISA for HIV were done. Samples from skin were collected from the active edges of the lesion by scraping with a blunt scalpel. Patients having multiple site infection were subjected to multiple sample collection from each site. The infected nails were clipped as far back as possible from the edge. Full thickness of the nail was included. Affected hairs were epilated.

The samples were subjected to direct microscopy in 10% KOH for skin samples (for 90minutes) and 40%

KOH for nail samples (for 24hours). These samples were also sent in a sterile petri dish and cultured in sabouraud dextrose agar (SDA) tubes into two sets. One group with chloramphenicol and other with cycloheximide to prevent growth with saprophytic fungi and bacteria and incubated at 37 and 25 degree celsius respectively.

Four weeks of inoculation was required. The cultures were examined for the presence of growth of fungi, colony morphology (i.e. colour, texture, topography and rate of growth in different media), characteristic pigment and microscopic morphology (i.e., its size, shape, topography, and arrangement of spores, types of hyphal appendages, and hyphal modifications) by Lactophenol Cotton Blue wet mount.

Data was statistically described in terms of mean (\pm SD), frequencies (number of cases) and percentages when appropriate. The Chi-square test was used to compare categorical data.

All the statistical calculations were done using Microsoft Excel 2007 (Microsoft Corporation, NY, USA) and SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 21.

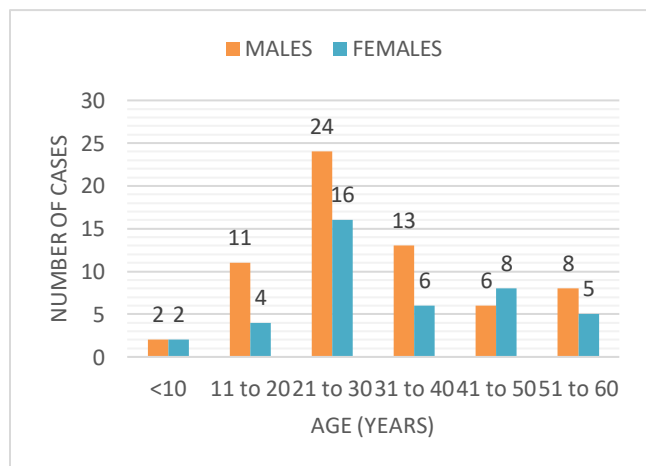
Results:

Out of 105 patients, 41 (39.05%) were females and 64 (60.95%) were males with male to female ratio of 1.56:1. The most commonly affected age group was 21 to 30 years with 40 (38.09%) patients followed by 31 to 40 years group with 19 (18.08%) patients. Whereas the least number of patients i.e., 4 (3.80%) belonged to less than 10 years age group. Other age groups involved were 11 to 20 years (14.28%), 41 to 50 years (13.33%) and 51 to 60 years (12.38) (Graph 1). Out of 105 patients, family members of 38 (36.19%) patients were affected (Graph 2). Six patients (5.71%) had associated diabetes mellitus and 3 (2.85%) had hypertension (Table 1). Among culture isolated clinical types of dermatophytosis, tinea corporis (14.28%) and tinea cruris (14.28%) were most common presentations, tinea faciei in 3 (2.85%) patients, and tinea manuum (0.95%) and tinea pedis in (0.95%) patient and no organism was isolated from clinical types of 70 patients (66.69%). (Table 2) Due to multiple body site involvement,

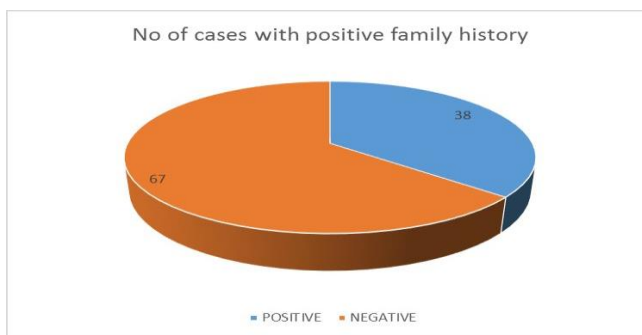
total number of clinical patterns were 221, out of which tinea cruris was the most common presentation seen in 70 (31.67%) patients followed by tinea corporis in 63 (28.50%), tinea cruris along with tinea corporis was seen in 41 (18.55%) patients. Other sites involved were tinea faciei (3.16%), tinea capitis (3.16%), tinea manuum (4.97%), tinea pedis (4.07%), and tinea unguium (5.88%). (Table 3)

Out of 105 patients, 78 (74.28%) patients samples were KOH positive for fungal elements and 45 (42.85%) were culture positive and showed growth over culture media. As multiple sites were involved in one individual, total number of clinical patterns were 221, out of which direct microscopy was positive in 164 (74.20%) and culture positivity was seen in 97 (43.89%). KOH positive and also culture positive were 90 (40.72%), KOH positive and culture negative were 76 (34.38%), KOH negative and culture positive were 6 (2.71%) & both KOH negative and culture negative were 49 (22.17%). (Table 4)

Out of 105 patients, only 45 (42.85%) patients showed growth of organism on culture media, out of which Trichophyton mentagrophytes (Figure 1 and 2) was the most common species isolated in 19 (42.22%) patients followed by Trichophyton rubrum (Figure 3 and 4) in 14 (31.11%) patients (Table 5). Other species isolated were Trichophyton tonsurans (Figure 5), Trichophyton violaceum, Trichophyton schoenleinii, and Microsporum canis (Figure 6).



Graph 1: Distribution of patients according to age and gender.



Graph 2: Family history distribution of Dermatophytosis

Table No.1: History/Associations with dermatophytosis infection

Sr.No	Illness	Total Cases
1	Diabetes mellitus	6 (5.71%)
2	Hypertension	3(2.85%)
3	HIV	0

Table No.2: Number of cases with organisms isolated on culture in different clinical types of dermatophytosis

Sr. No	Clinical Type	Total Cases
1	Tinea corporis	15 (14.28%)
2	Tinea cruris	15 (14.28 %)
3	Tinea faciei	3 (2.85%)
4	Tinea capitis	0
5	Tinea manuum	1 (0.95%)
6	Tinea pedis	1 (0.95%)
7	Tinea unguium	0
8	No organism isolated from clinical types of dermatophytes.	70 (66.69%)

Table No. 3: Overall distribution of clinical types of dermatophytosis

Sr. No	Clinical Type	No of Cases
1	Tinea corporis	63 (28.50%)
2	Tinea cruris	70 (31.67%)
3	Tinea faciei	7 (3.16%)
4	Tinea capitis	7 (3.16%)
5	Tinea manuum	11 (4.97%)
6	Tinea pedis	9 (4.07%)
7	Tinea unguium	13 (5.88%)
8	Mixed: Tinea corporis + Tinea cruris	41 (18.55%)
	Total clinical types	221

Table No. 4: Distribution of body sites involved with KOH & culture report correlation

Sr. no	Clinical types	No. of cases	Total KOH positive	Total culture positive	KOH positive culture positive	KOH positive culture negative	KOH negative culture positive	KOH negative culture negative
1	Tinea corporis	63 (28.5%)	51 (23.01%)	30 (13.57%)	29 (13.12%)	22 (9.95%)	1 (0.45%)	11 (4.97%)
2	Tinea cruris	70 (31.67%)	48 (21.71%)	29 (13.12%)	26 (11.76%)	22 (9.95%)	3 (1.35%)	19 (8.59%)
3	Tinea faciei	7 (3.16%)	5 (2.26%)	3 (1.35%)	3 (1.35%)	2 (0.90%)	0	2 (0.90%)
4	Tinea capitis	7 (3.16%)	3 (1.35%)	3 (1.35%)	2 (0.90%)	2 (0.90%)	1 (0.45%)	2 (0.90%)
5	Tinea manuum	11 (4.97%)	9 (4.07%)	4 (1.80%)	4 (1.80%)	5 (2.26%)	0	1 (0.45%)
6	Tinea pedis	9 (4.07%)	7 (3.16%)	3 (1.35%)	3 (1.35%)	4 (1.80%)	0	2 (0.90%)
7	Tinea unguium	13 (5.88%)	9 (4.07%)	5 (2.26%)	5 (2.26%)	4 (1.80%)	0	4 (1.80%)
8	Mixed type	41 (18.55%)	31 (14.47%)	18 (9.04%)	17 (8.59%)	15 (7.23%)	1 (0.45%)	8 (3.61%)
	Total	221 (100%)	165 (74.20%)	97 (43.89%)	90 (40.72%)	76 (34.38%)	6 (2.71%)	49 (22.17%)

Table No.5: Species wise distribution of dermatophytosis

Species	Total Culture Positive Cases	Males	Females
Trichophyton mentagrophytes	19 (42.22%)	13 (28.88%)	6 (13.33%)
Trichophyton rubrum	14 (31.11%)	6 (13.33%)	8 (17.77%)
Trichophyton tonsurans	6 (13.33%)	3 (6.66%)	3 (6.66%)
Trichophyton violaceum	3 (6.66%)	3 (6.66%)	0
Trichophyton schoenleinii	2 (4.44%)	1 (2.22%)	1 (2.22%)
Microsporum canis	1 (2.22%)	1 (2.22%)	0
Total	45 (100%)	27 (60%)	18 (40%)

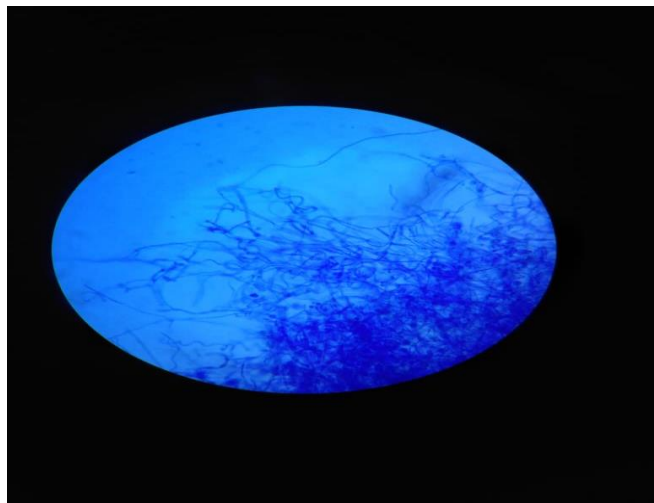


Figure No. 2: Micromorphology of Trichophyton mentagrophyte showing microconidia, spherical, and pyriform shaped, arranged in clusters along the hyphae



Figure No. 1: Colony morphology of Trichophyton mentagrophyte on SDA



Figure No. 3: Colony morphology of Trichophyton rubrum on SDA

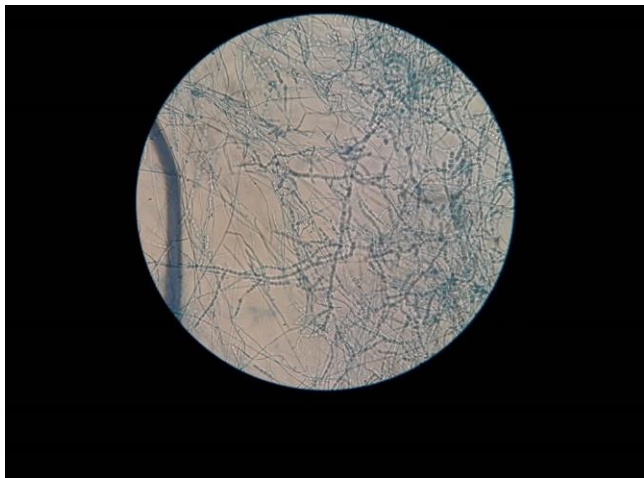


Figure No. 4: Micromorphology of *Trichophyton rubrum* showing microconidia present along the hyphae



Figure No. 5: Colony morphology of *Trichophyton tonsurans* on SDA



Figure No. 6: Colony morphology of *Microsporum canis* on SDA

Discussion:

In the present study, maximum number of patients were in their third decade. Similar findings were reported by Rathod PG et al. [5] and Agarwal US et al. [6]. The increased incidence of dermatophytosis in this age group may be due to the fact that this population group is involved in maximum outdoor activities such as agriculture and manual labour, which predisposes them to acquire infection from environmental exposure. Males were affected more than females which is similar to most of the earlier reports including studies done by Gupta et al. [7] and Sumana et al [8]. The increase incidence in males may be due to outdoor work, increase physical activity in hot humid climate, excessive sweating, and poor hygienic conditions and

wearing of occlusive clothing, predisposes to ring worm infection. Furthermore, lower incidence in females may also be due to the nonreporting of female patients to hospitals due to the social stigma in the rural population of India.

In our study, history of dermatophytosis in family members was elicited in 36.19 % patients. This finding is similar to the studies done by Mahajan S. et al. [9] and Kucheria M. et al. [10] Transmission in family members can be due to direct contact, through fomites or because of sharing towels, dresses, and soap with the family members which is a very common practice across India. Failure to bath daily and wear freshly washed clothes, wearing of damp undergarments also plays an important role in the spread of infection, leading to its persistence, and its recurrence which are important factors in treatment failure. Educating the parents and family members is essential for tackling dermatophyte infection and prevention of spread of dermatophyte infections.

Diabetes mellitus was the most common association seen in 5.71% patients which was similar to the observation made by Bindu V et al. [11] In the present study of 105 patients, 33.33% patients had single site involvement of infection and 66.66% patients had multiple site involvement. Among the patients who had single site involvement, tinea corporis and tinea cruris were the most common clinical types from which organism was isolated. The organism isolated from clinical types tinea cruris (14.28%) and tinea corporis (14.28%) followed by tinea faciei in 2.85%, tinea manuum (0.95%) and tinea pedis in 0.95 % patients. No organism was isolated from 66.69% clinical types.

Due to multiple body site involvement, total number of clinical patterns were 221, out of which tinea cruris was the most common presentation seen in 31.67% patients followed by tinea corporis in 28.50%, tinea cruris with tinea corporis together were seen in 18.55% patients, tinea faciei, tinea capitis, tinea manuum, tinea pedis and tinea unguium were seen in 3.16%, 3.16%, 4.97%, 4.07% and 5.88% respectively. Similar findings were noted by Kumar et al. [12] with 23.4% tinea cruris patients and 14% tinea corporis patients but combination of tinea cruris and tinea corporis was found in 39.3% patients while in our study only 18.55% patients had combination of both the clinical types.

Dash et al. [13] reported an almost equal prevalence of tinea cruris (50%) and tinea corporis (47.47%).

In our study, fungal infection in clinical samples was detected by direct microscopy using 10% KOH for skin samples and 40% KOH for nail samples, which later on was confirmed by culture using sabouraud dextrose agar. 74.28% patients showed KOH positivity and only 42.85% patients showed culture positivity. This shows that direct microscopy by KOH mount is useful screening technique in the laboratory diagnosis of dermatophytosis. This study is in accordance with the study of Gupta et al. [7] and Doddamani et al. [14] who reported 55% and 65% KOH positivity and 46% and 39% culture positivity. There is a difference between KOH positivity rate and culture positivity rate i.e., fungal elements were seen under direct microscopy but samples failed to grow on culture which might be due to unsatisfactory collection of samples containing dead fungal hyphae.

As multiple sites were involved in one individual, total number of clinical patterns were 221, out of which direct microscopy was positive in 74.20% patients and culture positive was seen in 43.89% patients. KOH positive as well as culture positive were 40.72% patients, KOH positive and culture negative were 34.38% patients, KOH negative and culture positive were 2.71% patients and both KOH negative and culture negative were 22.17% patients. While Penmetcha et al. [15] reported KOH positive and culture positive in 68% patients, KOH positive and culture negative in 16% patients, KOH negative and culture positive in 6.4% patients and both negative in 9.6% patients.

In our study, out of 105 patients, only 42.85% patients showed culture positivity.

Trichophyton mentagrophytes was the most common species isolated in 42.22% patients followed by Trichophyton rubrum in 31.11%, Trichophyton tonsurans in 13.33%. Other species isolated are Trichophyton violaceum, Trichophyton schoenleinii and Microsporum canis in 6.66%, 4.44%, and 2.22% patients respectively. A study done by Basak P. et al. [16] also showed similar findings.

Superficial dermatophytosis is emerging as a public health problem with increasing frequency of familial infection. Counselling during the first visit of the patient regarding lifestyle modifications regarding compliances, modification in terms of personal hygiene, use of cotton clothing, and not sharing soaps, towels, clothes and bed linen is very important for good clinical outcome.

Conclusion:

The most common age group affected by dermatophytosis in our study was 21 to 30 years. In this study males were predominantly affected. Diabetes mellitus was the most common association with dermatophytosis in this study. Present epidemio-clinico-mycological study showed tinea cruris as the most common clinical pattern followed by tinea corporis and T. mentagrophytes as the most common causative agent of dermatophytosis in this tertiary care hospital of Pune in Maharashtra. Though species identification may help epidemiologically but being a non-sensitive test, it is not essential for the diagnosis. Counselling regarding lifestyle modification and treatment compliance is very important for better clinical outcome.

Conflict of Interest - Nil

Sources of Support - Nil

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