

Original Research Article

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Study of the Etiological Agents of Dermatophytosis in Patients Attending Dermatology Clinics of a Suburban Tertiary Care-centre in Western Maharashtra, India

Kalpna Angadi, Rabindranath Misra, Nikunja Kumar Das*,
Shrea Kapoor and Shahzad Mirza

Department of Microbiology, Dr D Y Patil Medical College Hospital and Research Centre,
Dr D Y Patil Vidyapeeth, Pimpri, Pune 18, India

*Corresponding author:

ABSTRACT

Dermatophytes are keratinophilic fungus that infects skin, hair and nails. They belong to the genera *Trichophyton*, *Microsporum* and *Epidermophyton*. Some infections are caused by non dermatophytic filamentous fungi which are often resistant to treatment used for infections caused by dermatophytes. Hence this study was taken up to isolate and identify the causative agents of dermatophytosis and guide in the institution of proper therapy. Methods: All skin, hair and nail samples from suspected cases of Dermatophytosis were processed according to the standard microbiological procedures. Results: Dermatophytosis was more common in males aged 21-30 years. *Trichophyton mentagrophytes* (*T. mentagrophytes*) was the most common isolate, followed by *Trichophyton rubrum* (*T. rubrum*) and *Trichophyton tonsurans* (*T. tonsurans*). Around 25% of the isolates were non dermatophytes like *Scopulariopsis brevecaulis*, *Aspergillus* species, *Fusarium* species and *Acremonium* species. Dermatophytic infections take a long time to diagnose and treat. It is only by culture, we can achieve the definitive identification of the infecting fungus. This is especially important in cases of nail and skin infections caused by non dermatophytic filamentous fungi which are often resistant to therapy caused by dermatophytic infections. In addition, isolation of the fungus will help in differentiating it from other skin conditions like Dermatitis and Psoriasis.

Keywords

Dermatophytosis,
Dermatology,
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Introduction

Dermatophytes are keratinophilic fungus that infect the stratum corneum of the skin, hairs and nails. They are classified into *Trichophyton*, *Epidermophyton* and *Microsporum* based on conidial morphology and microscopic structures. They can be anthrophilic, zoophilic or geophilic. Other

non dermatophytic molds are also responsible for causing infections of the skin, hairs and nails like *Aspergillus species*, *Scopulariopsis brevecaulis*, *Fusarium species*, *Acremonium species* etc.¹

Infection may affect different body sites. They cause skin lesions which are irregular rings with inflammatory borders. The degree of inflammation produced depends upon the

immunological competence of the host. Factors which increase the susceptibility to fungal infections are warm, moist conditions, occlusion of the site etc.

Fungal infections are contagious. *Tinea corporis* (*T. corporis*) and *Tinea cruris* (*T. cruris*) infection is transmitted by anthropophilic species and can spread from one person to another through fomites like combs, towels, contaminated clothing or bedding etc.

Cattle and pets can also be reservoir of infection, when infections are caused by zoophilic species such as *Microsporum canis* (*M. canis*), *T. mentagrophytes* and *Trichophyton verrucosum*. *Tinea pedis* (*T. pedis*) can happen with occlusive foot wear and walking barefoot near swimming pools, community baths and shower areas.

Nosocomial spread have been reported from patients or through health care workers. Fomites have played an important role in the spread of infections. *Tinea corporis* caused by *T. tonsurans* have been implicated in many institutional outbreaks¹.

Species identification can help in infection control especially during institutional or family outbreaks as it can pinpoint the source of infection¹.

Materials and Methods

The study was a cross-sectional study and was carried out in the Department of Microbiology of a suburban tertiary care hospital in Western Maharashtra over a period of 2 years from 2016 to 2017.

Ethical clearance approval was taken from the institutional ethics committee. All samples were taken from suspected cases of dermatophytosis from patients attending the

out-patient department after taking informed consent.

Scrapings of the skin were taken from the active margin of the lesions after disinfection with 70% alcohol.

Nail clippings or scrapings after cleaning with 70% alcohol were collected from the discoloured, dystrophic or brittle parts of the nails.

Hairs were removed by plucking them with forceps. The specimens were transported to the laboratory in paper envelopes.

In the laboratory, the samples were processed according to standard microbiological procedures².

Direct microscopic examination of the Potassium hydroxide (KOH) preparation was done using 10% and 20 % KOH. Isolation of the fungus was done by inoculating the samples in Sabourauds dextrose agar with and without Chloramphenicol and Cycloheximide and incubated at 25°C and 37°C. The slants were examined twice a week for a minimum of 4 weeks before being reported as negative. Identification was done based on growth rate, gross colony morphology, colour of the surface and reverse of the slant, production of diffusible pigment, microscopic morphology of the LPCB mounts. The microscopic features were confirmed by observing the LPCB mounts of the isolates obtained by slide culture. Other tests which were carried out were Urease test and hair perforation test for the identification of the infecting species.

Results and Discussion

A total 140 molds were isolated. Dermatophytes contributed to 73.57% (n=103) and non-dermatophytes 26.42% (n=37).

Majority of the isolates were from skin scrapings 81.4% (n=114) followed by isolates from nails 11.4 % (n=16) and hair 7.14% (n=10).

Infection was more common in 21-30 years age group which formed 27.86% of the isolates (Table 1).

Infection was more common in males (65.7%) than females (34.3%) with M: F close to 2:1.

T. mentagrophytes was the most common isolate (n=25, 24.27%) (Figure 1) followed by *T. rubrum* (Figure 2) (n=18, 17.47%) and *T. tonsurans* (n=18, 17.47%) (Table 2).

Among the non- dermatophytes, *Scopulariopsis brevecaulis* (n=18, 48.64 %) (Figure 3) was the most common isolate followed by *Aspergillus spp.* (n=9, 24.32%). *Fusarium spp.* (n=8, 21.62 %) and *Acremonium spp.* (n=2, 5.4%) (Table 3).

Among the dermatophytes *T mentagrophytes* was the main isolate from skin (22 out of 25) and nails (3 out of 25). 17.47% isolates were *T. rubrum* and also *T. tonsurans* and were mainly isolated from skin scrapings from cases of Tinea corporis and Tinea cruris (n=18).

Trichophyton violaceum (*T. violaceum*) isolates formed 8.73% (n=9) (Figure 4) and were isolated mainly from nails, hair and skin scrapings (*T. cruris*).

Epidermophyton floccosum (*E. floccosum*) contributed to 8.73% (n=9) and were isolated from nails and skin scrapings from *T. cruris*.

T. verrucosum formed 7.76% (n=8) and were mainly isolated from skin scrapings of *T. cruris* and from nail and hair.

Likewise, *Microsporium gypseum* (*M. gypseum*) and *Microsporium audounii* (*M.*

audounii) formed 5.82% of the isolates each and were isolated from cases of Tinea capitis and Tinea corporis.

Other less common isolates were *M. canis*, (3 out of 103) and *M. nanum* (1 out of 103) (Table 4).

Non dermatophytes were predominantly isolated from cases of Onychomycosis (15/140).

Scopulariopsis brevecaulis (18/27) was the most common isolate among the non dermatophytes and was mainly isolated from cases of Onychomycosis and next were from *T. corporis* and *T. cruris* (4 each) followed by *T. pedis* (3 cases).

Aspergillus spp. (9/37) was the next common isolate from cases of Onychomycosis, Tinea capitis and Tinea corporis.

Fusarium (8/37) was isolated mainly from cases of Onychomycosis and Tinea capitis.

There were 2 isolates of *Acremonium species* from cases of Onychomycosis (Table 4).

A total of 140 molds were isolated from skin scrapings, hairs and nails. Majority of the isolates were dermatophytes. Dermatophytes contributed to 73.5% (n=103) of the isolates and non dermatophytes 26.42%.

Dermatophytes were the predominant isolates in other studies too^{3,4}.

Majority of the isolates were from skin scrapings (n=114, 81.4%), followed by nails (n=16, 11.4%) and hair (n=10, 7.14%).

Isolates from skin scrapings were mostly from cases of *T. corporis* (n=30) and *T. cruris* (n=25). Skin infections and isolation from them were also common with other studies⁵⁻⁸.

Infection was more common in 21-30 years age group from which, 27.86% were isolated. Similar findings were seen in other studies^{4,6,9}. The reason for the increased incidence in this age group and gender could

be due to suburban location of the hospital and the patient's occupation being agriculture and rearing of livestock.

Table.1 Distribution of the molds according to age

Sr. No.	Age group	No.	%
1	<1	2	1.42
2	1-10	22	15.71
3	11-20	29	20.71
4	21-30	39	27.86
5	31-40	29	20.71
6	41-50	10	7.14
7	51-60	5	3.57
8	61-70	2	1.42
9	71-80	2	1.42

Table.2 Distribution of different types dermatophytes

Isolates	Number	%
<i>T. mentagrophytes</i>	25	24.27
<i>T.rubrum</i>	18	17.47
<i>T.tonsurans</i>	18	17.47
<i>T.violaceum</i>	9	8.73
<i>E. floccosum</i>	9	8.73
<i>T. verrucosum</i>	8	7.76
<i>M.gypseum</i>	6	5.82
<i>M.audounii</i>	6	5.82
<i>M. canis</i>	3	2.91
<i>M. nanum</i>	1	0.97

Table.3 Distribution of different types of non dermatophytes

Isolates	Number	%
<i>Scopulariopsis brevecaulis</i>	18	48.64
<i>Aspergillus</i>	9	24.32
<i>Fusarium</i>	8	21.62
<i>Acremonium</i>	2	5.40

Table.4 Distribution of dermatophytes and non dermatophytes according to sites of infection

	Total	Nail	Hair	<i>T.pedis</i>	<i>T.capitis</i>	<i>T.corporis</i>	<i>T.cruris</i>
Dermatophytes							
<i>T. mentagrophytes</i>	25	3		5	3	9	5
<i>T.rubrum</i>	18	3		1	1	7	5
<i>T.tonsurans</i>	18	2	2	3	2	5	4
<i>T.violaceum</i>	9	2	2	1	1	1	2
<i>E.floccosum</i>	9	3		1		2	3
<i>T. verrucosum</i>	8	2	2		1		3
<i>M.gypseum</i>	6		2		1	2	1
<i>M.audounii</i>	6				2	3	1
<i>M.canis</i>	3		2			1	
<i>M.nanum</i>	1						1
Non- dermatophytes							
<i>S. brevecaulis</i>	18	6		3	1	4	4
<i>Aspergillus</i>	9	3		1	3	2	
<i>Fusarium</i>	8	4	1		3		
<i>Acremonium</i>	2	2					

Fig.1 LPCB mount showing septate hyphae with numerous round to subspherical microconidia formed along the hyphae or engrappe and spiral hyphae suggestive of *Trichophyton mentagrophytes*

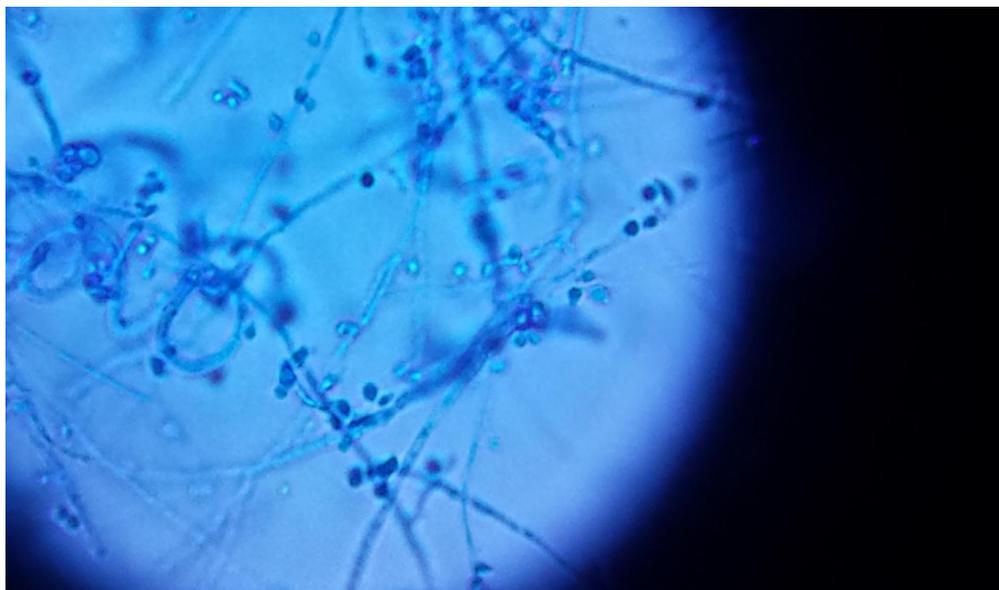


Fig.2 Slant of SDA showing white colony growth with a purplish red pigment suggestive of *Trichophyton rubrum*



Fig.3 LPCB mount showing aggregated annellophores in a scopula and rough annelloconidia suggestive of *Scopulariopsis brevecaulis*

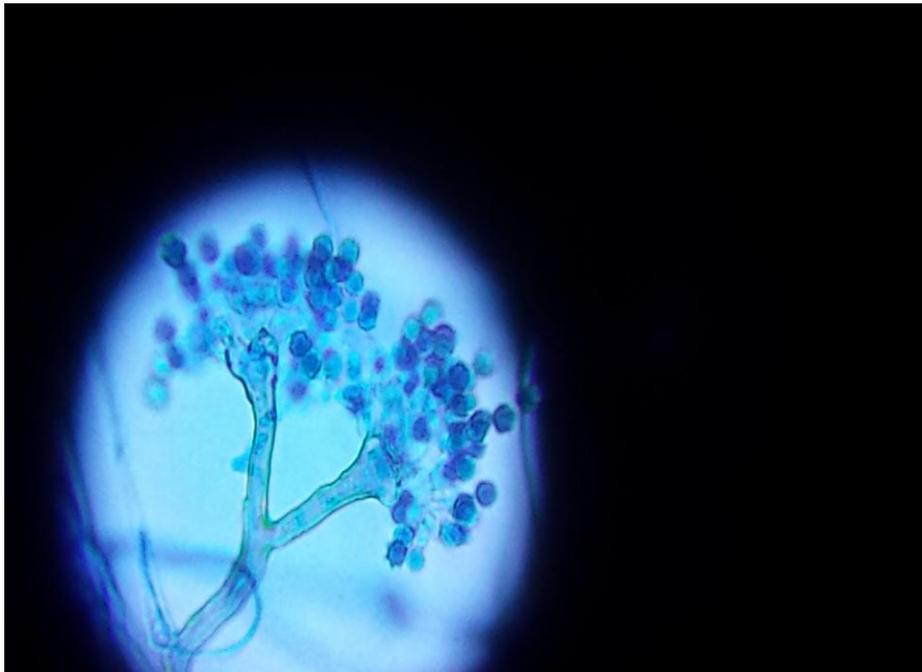


Fig.4 Slant of SDA showing waxy, wrinkled, deep purplish red growth suggestive of *Trichophyton violaceum*



Infection was more common in males (65.7%) than females (34.3%) with M:F ratio close to 2:1. Males were commonly affected in few other studies^{5,9}.

Worldwide *T. rubrum* is the commonest isolate found in dermatophytosis¹⁰⁻¹³. However, in our study *T. mentagrophytes* was the most common isolate followed by *T. rubrum* and *T. tonsurans*. *T. mentagrophytes* was the commonest isolate in other studies^{5,6}, whereas *T. tonsurans* was common in the study by Grover *et al.*, in NE India⁴. This indicates the changing pattern in the distribution of dermatophytes.

Among the non dermatophytes, *Scopulariopsis brevecaulis* (n=18, 38.64%) was the commonest isolate followed by *Aspergillus spp.*, (n = 9, 24.32%) and *Fusarium* (n=8, 21.62%) and *Acremonium* (n=2, 5.4%). *Penicillium* and *Fonsecaea spp.* were the predominant nondermatophytes in a study by Kaur *et al.*,¹⁴ Motamedi *et al.*,¹⁵ in a study in Tehran noted *Aspergillus* and

Fusarium to be the common non dermatophyte. Since these infections can spread from one person to another and can be acquired from animals, these infections can be controlled by vigorous preventive measures. So, all patients with dermatophytosis and their contacts should be investigated and treated. Good hygiene and sanitation and use of fungicidal sprays and washes, avoidance of sharing head gear, combs and hair brushes, disinfection of the instruments after use in barbers shop are effective preventive measures.

Nosocomial spread in hospitals can be prevented by identifying and treating the source of infection until then protective clothing to be worn by HCW to avoid direct contact. Contaminated clothing and bedding, towels are to be washed and disinfected before it is used by other people.

Infected animals and pets which are the reservoir of infection should be identified and treated. T pedis can be controlled by good foot hygiene, using antifungal powders,

avoiding wearing tight foot wear and walking bare foot esp. in swimming pools and community bath areas.

In conclusion, fungal infections require therapy for weeks. Fungal lesions of Dermatitis and Psoriasis and accurate diagnosis are possible only with isolation of the fungus by culture. Hence isolation of the fungus by culture especially of the nails aids in decisions about diagnosis and treatment. Moreover, the choice of therapy depends upon the specific identification of the infecting mold. This is especially important in case of nail and skin infections caused by non dermatophytic filamentous fungi which are often resistant to treatment which is used for dermatophytic infections. Hence this study was taken up to isolate and identify the infecting mold. It also helps to know the changing trends in the distribution of fungus across different geographical areas.

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