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Dermatophytosis: A Clinico-mycological profile from a tertiary care hospital

Venkatesh V N[1], Swapna Kotian[2]

Abstract:

Dermatophytosis, one of the most common diseases around the world shows a widespread prevalence in a tropical country like India, it is thus important to know their pattern of etiology and clinical presentation. The study aimed to determine the clinical variants of dermatophytosis and species of fungi responsible for the disease in this region. A total of 1590 samples collected which included skin, hair and nail for a period of 2 years and was processed based on standard protocol. Out of 1590 samples taken, 784(49.3%) were KOH positive for fungal elements and 747 (46.98%) were culture positive. *Trichophyton mentagrophytes* 214(13.46%) was the predominant species isolated. Tinea corporis 911(57.30%) was the commonest clinical type seen. The study highlighted Tinea corporis to be the most common clinical type with multiple etiological agents and *T.mentagrophytes* as the most common etiological agent involved in various clinical conditions.

Key words: Dermatophytosis, *Trichophyton mentagrophytes*, Tinea corporis

Introduction:

Dermatophytosis is one of the most common diseases around the world caused by colonisation of keratinised tissue of the nail, hair and skin by dermatophytic fungal species of Trichophyton, Microsporum and Epidermophyton. [1,2] It is commonly referred to as ringworm or Tinea, generally cutaneous and restricted to the non-living cornified layers because of the inability of the fungi to penetrate the deeper tissues or organs of the immunocompetent host. [3, 4] The most common symptom seen in humans with dermatophyte infection is pruritis [2,5] while the infection may range from mild forms like seborrhoeic dermatitis to severe forms like favus depending on the host's reaction and local environmental factors.[6] It spreads by direct contact from infected human beings (anthropophilic), animals (zoophilic), soil organisms (geophilic) or indirectly from fomites. No race in any geographical location is free from dermatophytoses [1] and it has been reported worldwide though with variation in distribution, incidence, epidemiology, etiological agent and target from one location to another with the passage of time.[7] Number of factors contribute for infection like geographical location, prevailing climate, overcrowding, healthcare, immigration, environmental hygiene, culture and socio-economic disposition. [6,8,9] It has also been noted that irrational use of antibiotic, corticosteroids and neoplastic drugs also known to contribute for dermatophytosis.[10]

India is a large subcontinent with varied topography with tropical and subtropical climate conducive for acquisition and maintenance of mycotic infection. Thus, this study was undertaken to know the prevalence, clinical and mycological profile for various dermatophytes.

Materials and Methods:

A total of 1590 samples were collected from suspected patients with dermatophytosis attending the dermatology department of our tertiary care district hospital for a period of 2 years from June 2014 to April 2016. After the approval from Institutional Ethics

Committee and obtaining a written informed consent from the patients, the samples were collected. At the time of collection, a detailed history in relation to age, sex, address, occupation, duration of illness, medication and clinical manifestations was noted; similar complaints in the family and contact with soil and animals were elicited and recorded. Prior to the sample collection, the infected area was cleansed with 70% alcohol and ensured for the dryness. Depending on the site of infection, the samples were collected by scrapings from the active edge of the lesion if it is skin, clipping of nail and subungual debris in case of nail infection; infected and lustreless hair were collected by plucking from base making use of sterile forceps along with scrapings.

The samples collected were folded into pre-sterilised black chart paper and each of this was labelled appropriately and directed for further proceedings. Each sample was subjected to direct microscopy using 10% KOH for skin and hair specimens and 40 % KOH for nail and looked for various fungal elements like hyphae, arthroconidia, sclerotic bodies etc. Further confirmation was made after processing the sample for culture on Saboraud's Dextrose Agar (SDA) and SDA with Chloramphenicol and Cycloheximide (SCCA) (Hi-media) and Dermatophyte Test Media (DTM) and incubated at 27°C for 4 weeks.

The cultures were examined regularly for a period of 1 month. On appearance of fungal growth, its colony and microscopic morphology were observed. If no growth was found after 45 days, it was considered negative for the growth of the fungi. Pure isolate were generated by subculturing on to SDA with Chloramphenicol and Cycloheximide for both macroscopic and microscopic examination of cultural and morphological characteristics respectively for further differentiation. Further identification was done by performing slide culture technique, hair perforation test and urea hydrolysis. Observations were then compared to identification criteria enumerated in Rippon (1988) and Larone (1995).

Results:

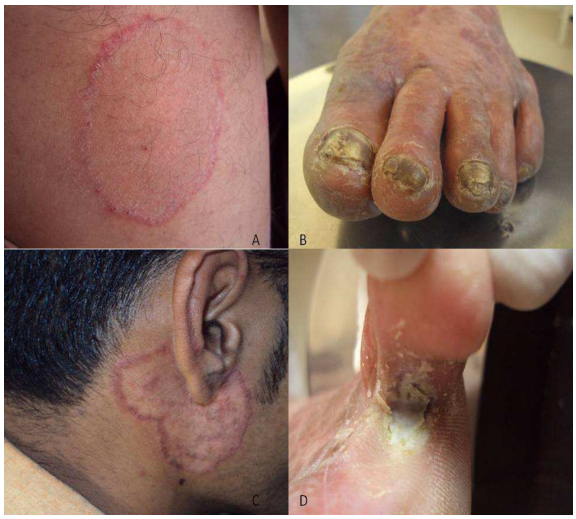
A total of 1590 samples were collected from suspected cases of dermatophytosis [**Figure I (A-D)**]. Tinea corporis 911(57.30%) was the predominant clinical condition observed followed by Tinea pedis 203 (12.77%) and Tinea cruris 171(10.75%) as seen in **Table I**. In males, the most prevalent infection seen was Tinea corporis 557(55.92%) followed by Tinea cruris 153(15.36%) while in females the most prevalent was Tinea corporis 354(59.40%) followed by Tinea pedis- 94(15.82%) as seen in **Table I**. Patients belonging to age group 16-30 years-651 (40.94%) and 31-45 years (20.75%) showed more rate of positivity in contrast to other age groups as observed in **Table II**.

Initial microbiological examination by direct microscopy showed the presence of typical dermatophyte structures such as sparsely branching hypal forms sometimes with regular chains of swollen cells, arthroconidia [**Figure IIA**] and ectothrix or endothrix infection in 784 (49.31%) cases as seen in **Table III**. In 218(13.71%) cases, dermatophytes were isolated from skin scrapings that were negative for fungal elements on microscopic examination, probably because they were few and were missed in the observation or due to the presence of inactive sporulating phase which were missed during microscopy.

Dermatophytes formed the majority of the isolates accounting for 614(38.62%) followed by Non-dermatophytes and phaeoid group 240(15.09%) and the unidentified group 84(5.24%). The various dermatophyte species isolated and their frequency distribution is shown in **Table IV**. *T. mentagrophytes* 214(13.46%) was

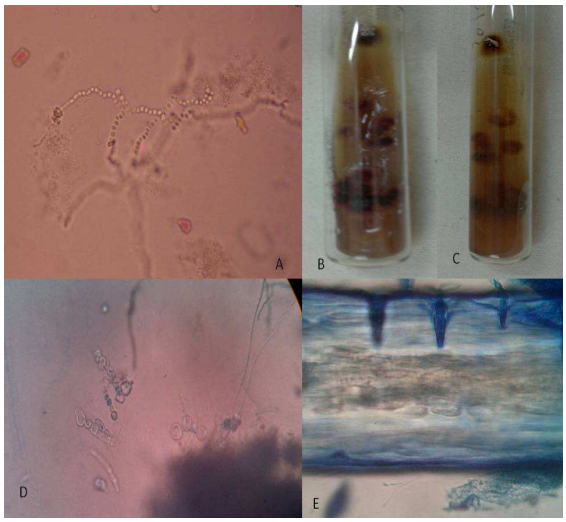
the most common isolate followed by other species of dermatophytes.

Figure I: Various clinical manifestations



A. Tinea corporis showing centrifugal ring with leading margin
B. Nail infection showing brittle, discoloured nail
C. Tinea corporis
D Tinea pedis infection showing maceration between the toe web

Figure II: Diagnostic Methods



A. KOH showing septate hyphae with arthroconidia
B. *T. violaceum* obverse morphology
C. *T. violaceum* reverse morphology
D Lactophenol Cotton blue mount
E. Positive Hair perforation test

It was seen that *T.mentagrophytes* was the main etiological agent of tinea corporis, tinea cruris, tinea pedis and tinea fasciae (**Table V**).

Table I: Prevalence with reference to clinical presentation and sex

Clinical manifestation	Total no of sample n[%]	Sex	
		Male n (%)	Female n (%)
Tinea corporis	911 (57.30)	557 (55.92)	354 (59.40)
Tinea capitis	82 (5.16)	42 (4.22)	40 (6.73)
Tinea cruris	171 (10.75)	153 (5.36)	18 (3.03)
Tinea pedis	203 (12.77)	109 (10.94)	94 (15.82)
Tinea barbae	18 (1.13)	18 (1.81)	0
Tinea versicolor	8 (0.50)	3 (0.30)	5 (0.84)
Tinea fasciae	61 (3.84)	37 (3.71)	24 (4.04)
Tinea nigra	20 (1.26)	12 (1.20)	8 (1.35)
Onychomycosis	116 (7.30)	65 (6.53)	51 (8.59)
Total	**1590**	**996 (62.64)**	**594 (37.36)**

Table II: Distribution in various age groups

Age	Prevalence(%)
5-15 years	190 (11.95)
16-30 years	651 (40.94)
31-45 years	330 (20.75)
46- 60 years	281 (17.67)
> 60 years	138 (8.68)
Total	1590

Table III: Direct microscopy and culture correlation

	KOH Positive (%)	KOH Negative (%)	
Culture Positive	724 (45.53)	218 (13.71)	942 9.23)
Culture Negative	55 (3.46)	593 (37.30)	648 (40.75)
	779 (48.99)	815 (51.265)	

Table IV: Spectrum of isolation of dermatophytes

Isolate	Prevalence (%)
No growth	652 (41.01)
T. mentagrophytes	214(13.46)
T. rubrum	55 (3.46)
T. mentagrophytes var interdigitale	56 (3.52)
T. violaceum	28 (1.76)
T. soudanense	26 (1.64)
T. schoenleinii	8 (0.50)
T.tonsurans	14 (0.88)
T.verrucosum	13 (0.82%)
T.species	124 (7.80%)
M. adouinii	7 (0.44%)
M. gypseum	8 (0.50%)
M. canis	3 (0.19%)
M.species	45 (2.83%)
E.flocossum	13 (0.82%)
Non-dermatophyte	127 (7.99%)
Phaeoid	113(7.11%)
Unidentified	84 (5.28%)
Total	1590

Discussion:

The epidemiology of dermatophytes has changed significantly in the last century and reflects changes in socio-economic conditions, life style, environment and migration. It is very difficult to ascertain reliability of incidence and prevalence of various skin diseases caused by dermatophytes because it may only be representative of the population sample, which may be have associated risk factors of infection.[11] Identification of the fungal etiology responsible for dermatophytosis is of importance not only for the epidemiology but also from therapeutic point of view when treatment is advised for a long time. As extreme variation in weather is noted in this region with severe summer and winter making the atmospheric temperature and humidity conducive for dermatophytosis. The study showed that 70.92% of the cases were positive for various fungal agents in contrast to other studies reported in the past. [12,13] The higher incidence of the dermatophytosis in this region in addition to the environmental conditions could also be attributed to the nature of work , the major population engages in manual labour , agriculture and livestock rearing and poor personal hygiene being maintained which predisposes to dermatophytosis and this is in agreement with majority of cases of recurrent and extensive disease. [12,13] It is also to be noted that because of common practise among the local population to take indigenous medication leading to delay in treatment and an important cause of interfamilial cases and spread of infection in the society.

In this study an overall male predominance was observed 996(62.64%) as compared to females 594(37.36%) which is in concordance with other studies.[12, 13, 14, 15] Higher incidence in male may be due to hard physical labour, working in hot and humid environment for a very long time. This leads to excessive sweating giving suitable environment for fungal agents to proliferate thus predisposing to dermatophytosis.

The most common dermatophytosis seen were tinea corporis 911(57.30%), tinea pedis 203 (12.77%) and tinea cruris 171(10.75%) which is in agreement with other studies in India.[14, 16, 17] This may be due to working in hot and humid environment and high rate of sweating in groin, waist, underarm and toe web making these sites more vulnerable to dermatophytosis.[18] Male predominance was seen in case of Tinea cruris which is in agreement with other studies reported earlier.

Tinea capitis 82(5.16%) was another major clinical condition with isolation of *Trichophyton violaceum* being the predominant etiological agent. The incidence of tinea capitis may be due to sharing of caps, scarf and combs among children. *T violaceum*, an anthropophilic fungi spreads by contact.[6]

Table V: Isolates in relation to various clinical types

Clinical manifestation	NG	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q
Tinea corporis	430	122	21	23	4	14	6	7	6	45	2	7	1	25	4	65	55	74
Tinea capitis	18	5	3	0	22	2	0	1	1	5	1	0	0	3	0	5	3	13
Tinea cruris	34	47	15	4	0	3	1	2	5	27	4	0	0	5	2	6	12	4
Tinea pedis	97	19	5	18	0	2	1	2	0	15	0	0	1	3	7	17	3	13
Tinea barbae	4	1	0	1	0	1	0	1	0	8	0	0	0	1	0	0	1	0
Tinea versicolor	2	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	4
Tinea fasciae	25	8	2	3	2	3	0		0	10	0	0	0	3	0	5	0	0
Tinea nigra	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	2
Onychomycosis	30	12	9	7	0	1	0	1	1	13	0	1	1	4	0	9	10	17

*NG- No Growth, a. Trichophyton mentagrophytes, b. Trichophyton rubrum, c. Trichophyton mentagrophytes var interdigitale, d. Trichophyton violaceum, e. Trichophyton soudanense, f. Trichophyton schoenleinii, g. Trichophyton tonsurans, h. Trichophyton verrucosum, i. Trichophyton species, j. Microsporum audouinii, k. Microsporum gypseum, l. Microsporum canis, m. Microsporum species, n. Epidermophyton flocossum, o. Phaeoid p. unidentified, q. Non- dermatophyte

A study from Nepal too has shown a prevalence rate of 4.6%.[19] Previous studies from India noted low prevalence and it was attributed to use of mustard oil over scalp. However, later similar studies showed no significance.[12, 13]

A single species of dermatophyte could cause different clinical manifestations as seen with *T. mentagrophytes* being the major isolate, from all the clinical types of tinea and a single clinical type like tinea corporis had several etiological agents.

T. mentagrophytes was the commonest etiological agent isolated. It is an anthropophililc fungi [6] and its high incidence may be due to nature of work, frequent interaction with people, living conditions, by sharing facilities like comb and towels which lead to spread of infection.[12] Inhabitation with domestic animals predispose to transmission of geophilic and zoophilic dermatophytes like *Microsporum gypseum, Trichophyton verrucosum, Microsporum canis* and variants of *T. mentagrophytes*. *T. rubrum* 55(3.46%) was isolated which is less in comparison to other studies from India. *Trichophyton soudanense* 26(1.64%) and *Trichophyton schoenleinii* 8(0.50%) have also been isolated and these particular species are rarely reported in literature. *T. schoenleinii* has more often been an isolate from case of favus [16] but in our study, it was one of the causes for tinea corporis.

Trichophyton verrucosum 13(0.82%) has been isolated mostly in tinea corporis and tinea cruris showing a very low incidence but worldwide it has also been shown as a dominant species. [12, 20, 21.]

E. floccosum formed only 13(0.82%) of the total dermatophytes isolated in our study and only few studies from India and abroad have shown *E.floccosum* as one of the dermatophytes isolated.[10,22] Few species of Microsporum too were isolated- *M.gypseum* 8(0.50%), *Microsporum audouinii* 7(0.44%) and *M. canis* 3(0.19%) and these being zoophilic and geophilic fungi [6] could be transmitted through household animals.

Non-dermatophytes too were isolated 127(7.99%); though commonly considered as contaminants, they have been reported to colonise damaged tissues and cause secondary tissue destruction. Their role in causing cutaneous infection isn't proven

yet and a primary pathogenic role of non-dermatophyte is controversial at best. [23]

It was seen that in 218(13.71%) of cases, direct microscopy was negative but culture showed positivity; this may be due to very less presence of fungal elements in the sample. Thus, they could not be visualised by direct microscopy and although false negative in 5 to 15% of cases is a ordinary practice,[1] high positivity in culture isolation could be due to use of selective media like SCCA and DTM which do not allow contaminant to grow. The age group most involved was between 16-30 yrs 651(40.94%) followed by 31-45 yrs 330(20.75%) which is on par with other studies.

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Authors details:

1. **Corresponding author:** Associate Professor, Department of Microbiology, Karwar Institute of Medical Sciences, Karwar, Karnataka- 581301, India; E-mail: vadnalvenk@rediffmail.com
2. Tutor, Department of Microbiology, Karwar Institute of Medical Sciences. Karwar, Karnataka, India