



EVALUATION OF DERMATOPHYTIC AND NON DERMATOPHYTIC CAUSE OF SKIN INFECTION IN A TEACHING HOSPITAL

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ABSTRACT

A skin infection due to dermatophytes has become a significant health problem affecting children, adolescents and adults. The present study was undertaken from January 2013 to December 2013 to study the clinical pattern and etiological agents of dermatophytic infection. Out of 147 seen samples collected, 73 were culture positive. Among culture positive 31 were dermatophytes (42.46%) and 42 were non - dermatophytes (57.53%). The current study emphasizes on both dermatophytic and non dermatophytic cause of various fungal skin infection which indeed helps in understanding the fungal infection pattern seen in different patients and choosing appropriate antifungal agent.

KEY WORDS: Dermatophytes, Dermatophytosis, Trichophyton, Candida



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INTRODUCTION

Dermatophytoses are the most common types of cutaneous fungal infections seen in man and animals affecting skin, hair and nails. These are caused by a group of closely related keratinophilic fungi, which are capable of invading keratinized tissues of skin and its appendages and are collectively known as dermatophytes. The disease process in dermatophytoses is unique for two reasons; firstly, no living tissue is invaded, the keratinized stratum corneum is simply colonized. However, the presence of the fungus and its metabolic products usually induce allergic and inflammatory eczematous response in the host^{1,2} Currently, upto 30% of the population may be infected by ringworm or one of the other dermatophytoses.

MATERIALS AND METHODS

Hospital based cross sectional study was done from patients attending Dermatology outpatient department of the SRM Medical College Hospital and Research centre kattankulathur during period from January 2013 to December 2013.

Sample collection³

1. skin scrapping :skin was decontaminated with 70% alcohol, small scales were scraped off from the margins by a blunt scalpel blade or glass slide and it was collected in a black paper envelope.
2. Hair epilation :complete hair was removed using epilation forceps or scraping was done using a blunt scalpel blade.
3. Nail clippings : site was cleaned with 70% alcohol , the clippings were taken from as far as possible and the full thickness was included.

Microscopic examination

1. KOH Mount preparation: a strong alkali was used as a clearing solution to observe fungi , usually a 10-20% was used depending on the specimen and 40% was usually used in case of nail clippings

Culture techniques

1. Materials from all the suspected cases of mycotic infection were cultured even though the direct examination failed to reveal the presence of fungus. The use of a variety of culture media and incubation at different temperatures of 25°C and 37°C were likely to increase the chances for recovery of the fungal pathogens.
2. For the purpose of identification DTM was used.

Slide culture technique

Slide culture was put up whenever it was difficult to identify moulds with tease mounts. The slide culture technique permits the microscopic observation of the undisturbed relationship of spores to hyphae. Nutritionally deficient media like corn meal agar, potato dextrose agars etc are good for enhancing sporulation. Tease mount should be performed before performing slide culture.

Lacto phenol cotton blue

Lactophenol cotton blue is used to mount fungi from cultures for microscopic study. The lactic acid preserves fungal structure, phenol kills the fungus, cotton blue stain is absorbed by the hyaline fungal structures to make them more distinct and glycerol provides the moist environment.

RESULTS

In this study the results have been divided into two groups based upon the clinical samples collected from the skin department. A total number of 147 patients were included for the study, they were diagnosed clinically to have fulfilled the criteria of fungal infection and were referred from the department of dermatology of SRM Medical College Hospital and Research Centre between January 2014 to December 2014.

Demographics

a) Sex Distribution

Among 147 patients studied, majority of the patients were males 58% (n=85), females

patients accounted for 42%(n=62), with a ratio 1.3:1

b)Age distribution

Most affected were in the age group of 21-30 yrs (44.21%) were most affected followed by >50 yrs (16.32%), 11-20 yrs (12.92%) , 31-40 yrs (12.24%), 0-10 yrs (8.84%) and 41-50 yrs (5.44%).

c)Occupation

Maximum number of patients were students 53.06% (n=78), housewife 18.36% (n=27),

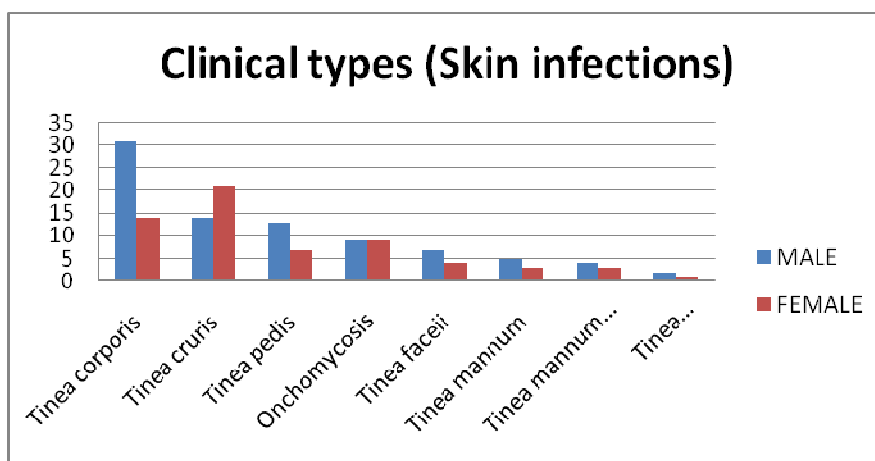
worker 12.24% (n=18), labourers 10.88% (n=16) and others 5.44% (n=8).

Graph 3: Distribution on the basis of occupation

d)Distribution of different clinical types

Following are the different types of clinical representation in which *Tinea corporis* (n=45), *Tinea cruris* (n=35), *Tinea pedis* (n=20), *onychomycosis* (n=18), *Tinea faceii* (n=11), *Tinea mannum* (n=8), *Tinea mannum + Tinea corporis* (n=7) and *Tinea faceii + Tinea corporis* (n=3) were seen.

Graph 4
Distribution of different clinical types

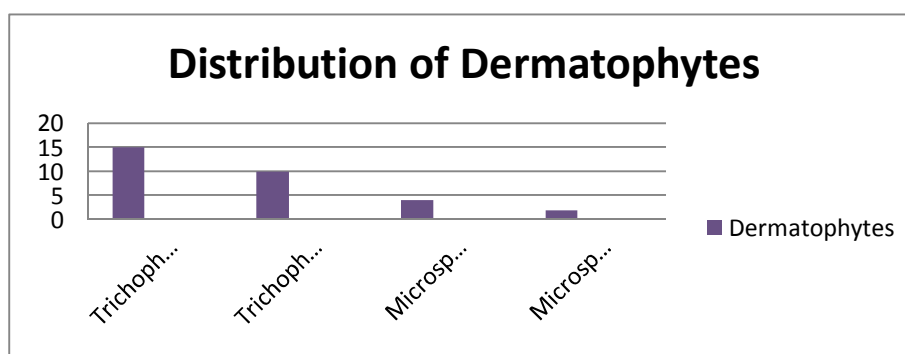


e)Correlation between KOH preparation and culture positivity

Table 6
Correlation between KOH preparation and culture positivity

	KOH Positive	KOH Negative	Total
Culture positive	68	5	73
Culture negative	14	60	74

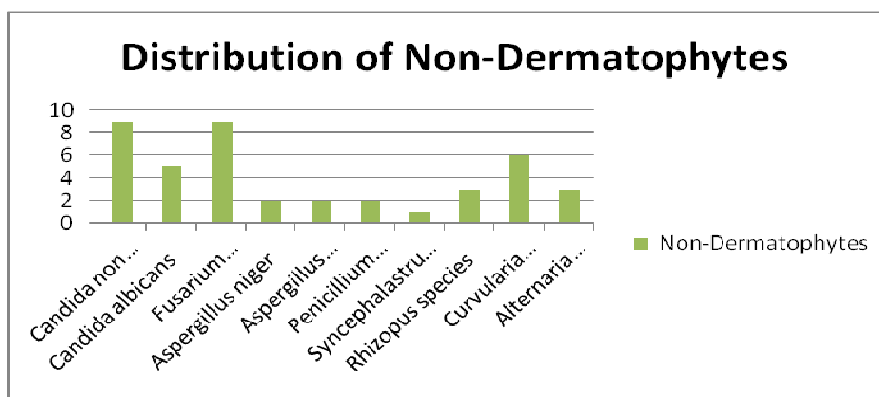
f)Distribution of culture positive organisms



Out of 147 seen samples collected, 73 were culture positive. Among culture positive 31 were dermatophytes (42.46%) and 42 were non-dermatophytes (57.53%). *Trichophyton mentagrophyte* 48.38% (n=15) was the

commonest dermatophyte followed by *Trichophyton rubrum* 32.25% (n=10), *Microsporum gypseum* 12.90% (n=4) and *Microsporum canis* 6.45% (n=2).

g) Distribution of Non-Dermatophytes



Candida non albicans and *Fusarium species* were the commonest non-dermatophyte isolate caused skin infections both accounting for 21.42% (n=9); followed by *Curvularia* 14.28% (n=6), *Candida albicans* 11.9% (n=5), *Rhizopus* 7.14% (n=3), *Alternaria* 7.14%

(n=3), *Penicillium species* 4.76% (n=2), *Aspergillus niger* 4.76% (n=2), *Aspergillus fumigatus* 4.76% (n=2) and *Syncephalastrum species* 2.38% (n=1). The two pathogenicity of non-dermatophytes was confirmed by repeated isolation atleast twice.

T.mentagrophytes



Tinea corporis



DISCUSSION

Dermatophytic infections are common worldwide and their epidemiological features vary according to the geographical area and have changed over time as a consequence of several factors, such as migratory streams, life style and socioeconomic conditions, and

incidence of peculiar co-morbidities. They are believed to affect 20-25% of the world's population, and the incidence continues to increase⁴. *Trichophyton rubrum* was the most common dermatophyte causing *Tinea pedis*, nail infection, *Tinea cruris* and *Tinea corporis* world wide. *Tinea pedis* and *onychomycosis* are becoming more common among the clinical

presentation⁵. The most important dermatophytes isolated in Europe are *T.rubrum*, *M.canis*, *T.mentagrophytes var.granulosum* and *T.verrucosum*. Several of these are believed to have spread from the Mediterranean countries. Other dermatophytes such as *M.audouinii*, *T.soudenense* and *T.violaceum* are endemic in Africa and some parts of Asia are currently rarely isolated in Europe⁶. In Asia *T.rubrum* and *T.mentagrophytes* are the most commonly isolated pathogens, causing *Tinea pedis* and unguium. The next commonly isolated pathogen is *T.violaceum*, the causative agent of *Tinea capitis* and *corporis*⁷. In northern India, anthropophilic dermatophytes are the predominant pathogens causing *Tinea capitis*. In a study of 153 consecutive patients with *Tinea capitis*, 90% patients were aged less than 15 years; 75% belonged to low socio economic group and 19% had a family history of *Tinea capitis*. Among which *T.violaceum* was the most commonest accounting 38%⁸. Nagabhusanam et al from Hyderabad reported the incidence of *Tinea* infections to be 4.2% of cases⁹. In Europe, the causative agent of *Tinea pedis* are *T.rubrum*, *T.interdigitale* and *E.floccosum*¹⁰. In Africa among anthropophilic dermatophyte, *M.audouinii* is the most prevalent pathogen, along with *T.violaceum*, *T.soudenens* and *Trychophyton gourvillii* which is endemic. In a study of 100 children in KwaZulu/natal, dermatologist identified *T.violaceum* in 90% of positive cultures, making it probably the most common cause of *Tinea capitis* in South Africa¹¹. In USA the most commonly observed fungal species are *T.rubrum* and *T.mentagrophytes*. A dramatic increase in *T.tonsuran* infections has been reported in the USA¹². The term "*Tinea corporis gladiatorum*" was created because *T.tonsuran* has high attack rates in teams of wrestlers, high level judo players and in other combat sports. This may be because of unique fungal etiology and the nature of the reservoir and vector, leading to specific clinical presentations and compliance difficulties for treatments¹³. Padilla A.et.al in 2002 from Spain reported the prevalence of dermatophytosis was 4.4cases/1000¹⁴. The

current study attempts to characterize the clinical and microbiological aspects of superficial fungal infections in 147 consecutive patients attending to a tertiary care centre in SRM Medical College and Hospital Research centre, Kattankulathur. Among the 147 patients diagnosed with dermatophytosis, our study demonstrated a male predominance, accounting 58% of the patients. This male to female ratio of 1.3:1 is also reflected in studies performed by Menan El et al¹⁵ and Ghannoum M et al¹⁶. This male predominance is seen in all age groups affected. Shah AK et al in 1976 from Ahmedabad reported the male to female ratio being 2:1¹⁷ where as Damle A.S et al from Ambajogai observed the male to female ratio being 4:1¹⁸. This could possibly reflect greater contact of males with the contaminating sources (soil/animals). In this study maximum number of patients were students 53.06%, followed by, house wives 8.36%, Workers 12.24% labourers 10.88% and others were 5.44%. In this study the population includes low socioeconomic group who are unaware of seriousness of the diseases, neglected the initial lesions and did not take any treatment so the presented with lesions at multiple sites which explains chronicity of lesions in some cases. *Tinea corporis* was the most common clinical diagnosis made. 45 of the 147 patients (30.61%) studied were diagnosed with *Tinea corporis*. This was found by itself and also in combination with other including *T.manuum* and *T.faciei*. This observation is similar to the other studies done by Peerapur et al conducted at Bijapur, Karnataka¹⁹ where 102 clinically diagnosed patients most common clinical pattern was of *Tinea corporis* followed by *Tinea cruris*,²⁰ where, *tinea corpis* (54.6%) was the commonest clinical type followed by *tinea cruris* (38.6%). In our study 23.08% of the cases were *Tinea cruris* making it the second highest clinical cases. Less aeration due to tight clothing maceration and high rate of sweating in groin and waist region make this site more vulnerable to dermatophytosis²¹. Direct microscopy by KOH examination is a commonly used modality to visualize and characterize the superficial mycoses. Although the yield of diagnosis is high, it could be still negative in a

significant percent of patients and also falsely negative in 5-15% of patients²². In our study 55.78% of the total patients examined were positive by microscopy where as in the study done by Peerapur et al fungal elements could be identified in 76% of cases by KOH preparation. In the other study done by Karmakar S et al²³ fungus identification by KOH mount was positive in 86% cases. Fungi were cultured in Sabouraud Dextrose agar; addition of antibiotics to the culture media inhibits the growth of bacteria and favours the growth of fungus. However the microbiological confirmation in our study was obtained in 27.7% of the patients which is similar to other studies done. *Trichophyton mentagrophyte* was the most common species identified on culture being positive by 48.38% which was followed by *Trichophyton rubrum*. In the other study done by Hay and Moore, *T.rubrum* have been the most common isolates²⁴. The other isolates among dermatophytes were *Microsporum canis* and *Microsporum gypseum*. Study done by Dalal A S and Murdia P from India however reported *Trichophyton rubrum* as the commonest isolates^{24,25}. Higher isolation rate(43.3%) of *Trichophyton violaceum* has been reported by Kamalam and Thambiah²⁶ from *Tinea capitis* cases in Madras and this species is supposed to be endemic in southern India.

Non-Dermatophytes

In the recent times the infections by the non-dermatophytic moulds have increased over a period of time. In Germany among the non dermatophytes Yeasts – primarily *Candida*

albicans – cause candidiasis of the skin and mucous membranes, non-dermatophyte molds (NDM) were considered *emerging pathogens*. In addition to known fungi, such as *Candida spp*, there are also *Fusarium* species and, rarely, other molds such as *Aspergillus fumigatus*, *Aspergillus ochraceopetaliformis*, *Acremonium spp.*, *Neoscytalidium dimidiatum* (previously known as *Hendersonula toruloidea*), *Arthrographis kalrae*, and *Chaetomium spp.* (along with *Trichophyton interdigitale*) as the causative pathogens for dermatomycosis²⁷ The non dermatophytic fungi among the culture positive included *Aspergillus flavus* (18.18%), *Aspergillus niger*(14.54%), *Candida albicans* (12.72%), *Candida spp* (5.45%), *Fusarium* (7.27%), *Mucor spp* (5.45%) and *Acremonium* (1.81%)⁽²⁸⁾ the prevalence of NDM's in our study was 57.53% which is different from that done 1548 cases which ranged from 1.45% to 17.6% and 50% in a study done on 207 samples done in Egypt²⁹ This variation shows the geographical differentiation and mold distribution along with different climatic situations. *Aspergillus spp* was the most common mould while yeast was the most common yeast which is akin to the study done by Khaby and Ramani et al in India²⁸ Among the NDM's the most common being *Fusarium* followed by *Candida non albicans* species was the result in the study done by M Mathur et al²⁹ which is similar to the results in our study which shows both *Fusarium* and *Candida non albicans* both accounting for 21.42 % followed by *Curvularia* which accounts for 14.28%.

REFERENCES

1. G.Kumaran,M.Jaya. Clinico-mycological profile of dermatophytic infections.Int J Pham.Bio.Sci, 5 (2): 1 – 5, (2014).
2. Macura AB. Dermatophyte infections. Int. J. Dermatol,32(1):313-323, (1993).
3. Singal A. Rawat S.Battacharya SN. Clinicomycological profile of *Tinea capitis* in North India and response to Griseofulvin. J. Dermatol, 28(1):22-26. (2001).
4. Blanka H,Viktor A.C.Markus. Epidemological trend in skin mycoses worldwide.Mycoses, 51(4):2-15.(2008).
5. Singh AK, Srinivasa KS etal. A clinicomycological study on *Tinea pedis* at Ranchi. Indian journal Dermatol Venerol Leprol, 60(2):68-71. (1994).
6. Morar N. Dlova NC, Gupta AK, Aboobaker J.*Tinea capitis* in Kwa-Zula Natal, *South Africa*.Int. J. Dermatol; 45(8):1006-7.(2006).

7. Nelson M M, Martin AG, Hefferman MP. Superficial fungal infections: Dermatophytosis, Onychomycosis, Tinea nigra piedra. In : Fitzpatrick TB(ed) Dermatology in general Medicine 6th edition. Vol2. New York: Mc Graw Hill.(2003),pp 1989-2005.
8. Poisson DM, Rousseau D, Defo D, Esteve E. Outbreak of Tinea corporis gladiatorum a fungal skin infection due to Trichophyton tonsurans, in a French high level judo team. Euro Surveill.10(9):187-90, (2005).
9. Anastasia Padilla, Antonio Sampedro, Pilo Sampedro. Clinical and epidemiological survey of dermatophytosis in Jean (Spain) Rev. Iberoam Micol, 19(1): 36-39. (2002).
10. Menan El et al ; Tinea capitis in school children from Ivory Coast, (Western Africa) Int. J. Dermatol, 41(4):204-207. (2002).
11. Gannoum M, Isham N, Hajjeh R. Tinea capitis in Cleaveland, J of Dermatology, 48(2); (2003).
12. Shah AK, Dixit CV, Shah BH, A study of dermatophytosis. Indian J. Dermatol Venerol Leprosy.; 42:225-230.(1976)
13. Damle AS, Fule RP. Mycology of cutaneous fungal infections in Ambajogai: a rural area. Indian J. Dermatol venerol leprosy; 47:266-268.(1981)
14. Lugo-Somolinos A, Sanchez JL. Prevalence of dermatophytosis in patients with diabetes. J An Acad Dermatol. 26(2).408-410. (1992).
15. Singh A, Thappa DM, Harnide A. The spectrum of mucocutaneous manifestations during the evolutionary phases of HIV disease. An emerging Indian Scenario. J. Dermatol(Tokyo).26(5):294-304.(1999).
16. Peerapur BV, Inamdar AC, Pushpa PV, Srikant B. Clinicomycological study of dermatophytosis in Bijapur. Ind. J .Med. Microbiology. 22(4):273-274.(2004).
17. Bindu v, Pavithran K. Clinicomycological study of dermatophytosis in Calicut .Indian J. Dermatol Venerol Leprol; 68(5):259-61. (2002)
18. Ranganathan S, Menon T, and Senthamil GS. Indian J Dermatol Venerol Leprol. 61(1):16-18. (1995).
19. I Weitzman and RC Summerbell. The dermatophyte clinical Microbiol Rev. 8(2):240-259. (1995).
20. Karmakar S, Kalla G, Joshi KR. Dermatophytosis in a Desert district of Western Rajasthan. Indian J. Dermatol Venerol Leprol. 61(5):280-283.(1995).
21. Hay RJ, Moore MK, Mycology .In: Burns T, Breathnach S, Cox N, Griffiths C, editors. Rook's text book of Dermatology 6th ed. Oxford: Blackwell Science: (2004).pp31-101.
22. Dalal AS, Dhruva A, Mogra N, Mehra SK. Dermatophytosis in South East Rajasthan. J.Ind.Med Asso.83(6). 197-199. (1984).
23. Murdia P. Dermatophytosis in Udaipur region. (Rajasthan). Ind . J. Dermatol. 32(1):5-10.(1987).
24. Kamalam A, Thambiah AS. Prevalence of Dermatophytosis in Madras city. Ind J. Med.Res.73(1):513-518.(1981).
25. Drakensjö IT, Chryssanthou E. Epidemiology of dermatophyte infections in Stockholm, Sweden: a retrospective study from 2005–2009. Med Mycol. 49(5): 484–488. (2011).
26. Vardraj V. Pai, Hanumanthayya. Clinical study of Tinea capitis in Northern Karnataka. A three year experience at single institute. Ind Dermatol J.4(1):22-26.(2013)
27. El Batawi MM, Arnaut H, Shoeib S, Bosseila M, El Fangray M and Helmy AS. Prevalence of non dermatophyte molds in patients with abnormal nails Egyptian dermatology online Journal. 2(1):12.(2006).
28. Tosti A, Piraccini BM, Irenzi S. Onychomycosis caused by non dermatophytic molds. J Am Acad Dermatol.42(2):217-224.(2000).
29. Ramani R, Srinivas CR, Ramani A, Kumari TGR, Shivananda PG. Molds in onychomycosis. Int J Derm.32 (12):877-878.(1993).