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Original Research Article

Dermatophytosis - A clinico-mycological profile in patients attending to tertiary healthcare centre- An observational study, Dewas, Madhya Pradesh

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ABSTRACT

Background: Dermatophytosis disease was found most common disease worldwide which showed a wide prevalence in tropical country as India and it is a wide importance to know their disease etiology and their clinical presentation. Study objective approaches to determine the clinical variation in Dermatophytosis and the species of fungus isolates which responsible for the infection in this area.

Materials and Methods: In our study 1520 specimens were taken from infected skin, hair and nail screened by 10%-20% KOH mount examination and used Sabouraud's Dextrose Agar (SDA) medium and Sabouraud's Dextrose Chloramphenicol and Cycloheximide (SCCA) & Dermatophyte Test Medium (DTM) for culture and incubated at 27°C. Further identification done by slide culture method and lactophenol cotton blue mount.

Result: Out of 1520 samples taken, 981(64.54%) were found KOH mount positive for fungal elements and 1076 (70.79%) were found culture positive. *Trichophyton mentagrophyte* (21.64%) was found predominantly among other isolated species. Study was found Tinea corporis (50.39%) as common clinically.

Conclusion: The study was highlighted with Tinea corporis being the commonest infection type with variable fungal agents and out of other fungal isolates *T. mentagrophyte* was found a most common isolate in various clinical conditions.

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1. Introduction

Out of other diseases, Dermatophytosis was found worldwide as a disease of keratinized tissue colonization (nail, hair and skin) by dermatophyte fungal species of *Trichophyton*, *Microsporum* and *Epidermophyton*.^{1,2} These fungus diseases mainly restricted to the specific layer of skin including non-living layer. The disease commonly defined as ringworm or Tinea which was generally restricted to the non-living skin layers as cutaneous due to incapability for penetration by the fungi to either deeper tissues or organs of the immunocompetent individual.^{3,4} These fungal

infections assume that the use of immunosuppressant drug treatment topically as well as orally in irregular manner may re-produce disease complication in the infected patients. The fungal organisms produce enzymes as Keratinases which degrade the keratin from the site of infection thus fungus invade the superficial surfaces of skin. In last few years, India has been documented increased record of dermatophyte infection with variable folds and also found a change in the different clinical presentation, severe condition, response to drug and relapsing of infection with same of different fungus.

Dermal infections from longer time are the part of confusion in relation with other skin disorders, so for the treatment or management of disease require early

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diagnosis. Dermatophyte infections were identified in hot and humid climate predisposes the skin.⁵ In humans, the pruritis was found a most common symptom in dermatophyte infection.^{2,6} In earlier study the Infection showed as seborrheic dermatitis in the mild form and sever form as favus on the basis of reaction and local environmental factors in host and the infection as tinea was found prevalent in around the world. Commonly appear tropically but it also spread epidemically in different geographical areas with the conditions of high humidity, overcrowded and unhygienic.⁷ Spread of disease was recorded as direct contact with infected human (Anthrophilic), animals (Zoophilic), environmental (Geophilic) or indirectly through fomites. Racially no one is free from dermatophytosis at any geographical location¹ and also reported worldwide variation in geographical distribution, occurrence, epidemiology, causative agent and pick out from one locality to other with the passing of time.⁸ Most of the studies fungus *Trichophyton* found more prevalent than the other fungus as *Microsporum* and *Epidermophyton* species which were classified earlier morphologically in three genera by Emmons.⁹ Where the *Trichophyton mentagrophyte* was found a principal organism with diversity of clinical picture. Diseases association with factors which contribute for infection as geographical locality, available climate, congested living status, health care, relocation, hygienic environmental, social activity and socio-economic arrangement.^{7,10,11} It also depends on use of antibiotic, steroidal and cancer drugs which may induce dermatophytosis.¹²

In the country different studies have been conducted in different parts of including Madhya Pradesh^{13–15} and few other states. Indian country as a large area with tropical and subtropical variability of climate act a role for acquisition of these type of fungal infection and also maintain it for longer period with routine life style. So, the study undergone to know about prevalence and clinical status with mycological profile of infective agents as various dermatophyte.

2. Materials and Methods

A cross-sectional study was conducted. In the study 1520 specimens were collected from suspected clinical condition of patients with skin infection, attended the dermatology department of our tertiary care Amaltas Institute of Medical Sciences, Dewas, Madhya Pradesh from 2017 to 2019. In the study, Samples were used for culture which were received from OPD patients and did routinely microscopic diagnostic test and the study was approved by institutional ethical committee. Specimen collection was done with patient related information as age, sex, address, occupation, duration of illness, medication and clinical illness, similarity of clinical type with in the family background, field related work as contact with soil and animals were also recorded. Before collection of specimens from suspected patients,

preparation of patient was done by cleaning the infected area with 70% ethanol and ensured for dryness. According to the site of infection the specimens were collected by scrap the active edge of the lesion of skin, clipping of infected nail part and sub unguis debris in case of nail infection, infected or lusterless hairs were collected by using a sterile forceps along with scrapping as per requirement.

The specimens were collected into presterilized black chart paper and labelled each of this appropriately and directed for further procedure. Each specimen was processed for direct microscopy by using 10% KOH solution for skin and hair specimens and 40% KOH for nail specimens then hold for 1 hour to 2 hours and observe under 10X and 40X objectives for various fungal elements like hyphal forms, arthroconidia, sclerotic bodies etc. For the confirmation, specimens were cultured on Sabrouraud's Dextrose Agar and for inhibition of contaminant used SDA with Chloramphenicol and Cyclohexamide medium (Hi-media) and Dermatophyte Test Medium incubated at 27°C.

The specimen's cultures were observed regularly for a period of one and half month. After the observation of fungal growth, its colony appearance and microscopic morphology were observed and noted for phenotypic identification. For the no growth record culture medium observed for 45 days which was considered no growth of fungi from specimen. Pure culture was done for identification at level of both macroscopic and microscopic for differentiation. For identification also performed the Slide culture technique, Hair perforation test and Urea Hydrolysis. Followed the identification by criteria enumerated in Rippon (1988) and Larone (1995).¹⁶

2.1. Statistical analysis

In the study Data obtained was entered into Microsoft word and Microsoft excel to generate the tables. Statistical analysis of categorical variables (age and sex) was described in descriptive way by percentages and frequencies of various characteristics.

3. Result

Total of 1520 samples were received from suspected cases of infection related dermatophytosis (Figures 1 and 2 A-C) and patients included in the study ranged in age from few months to more than 60 years. Tinea corporis (50.39%) was found major clinical condition than the other as Tinea cruris (14.80%), Tinea pedis (10.59%) and Tinea fasciae (8.68%). Males were found higher clinical condition as Tinea corporis, Tinea cruris and Tinea pedis sequentially but in females were found with Tinea corporis, Tinea pedis and Tinea fasciae as seen in Table 1. Patients were among 16-30 years (43.95%) and 31-45(22.43%) age group found higher than the other age group Table 2.

Microbiological examination in direct microscopy showed sparsely branching hyphal forms with regular chains of swollen cells, arthroconidia (Figure 3 A-C) and ectothrix or endothrix (Figure 3 D) infection in 64.67% cases. Split up showed the positive pattern of fungal elements in various clinical conditions, Tinea unguum (90.48%), Tinea cruris (78.22%), Tinea capitis (75.44%) (Table 3). Our study was found 6.25% positivity for fungal culture from skin scrapping that was found negative for fungal elements in microscopic examination, probably it was presence of fungal element in few or scanty quantity in specimen which was missed during microscopy.

Dermatophytes were found the majority of the isolate with 51.18% followed by Non dermatophytes (16.71%) and the unidentified group (3.16%). Various dermatophytes isolated in majority with *T. mentagrophyte* (21.64%) was followed by other species of dermatophyte and Non dermatophytes (Table 4).

In study *T. mentagrophyte* (Figure 4B, Figure 5A, C) was found a major etiological agent of tinea corporis followed by tinea cruris, tinea pedis including tinea unguium. *Trichophyton rubrum* (Figure 4D) was also found majority in tinea corporis and tinea unguium. *Trichophyton violaceum* (Figure 4A & Figure 5B) in the study was identified from Tinea capitis. *Microsporum species* and *Epidermophyton floccosum* were found from Tinea corporis (Table 5).



Fig. 1: A&C: Tinea corporis showing annular scaly, erythematous patches; B: Tinea cruris extending the sides of inner thigh

4. Discussion

The epidemiological status of dermatophyte was found significant change in the last century and which reflects changes socio-economically, life style, environment and migration. It is variable finding of incidence and prevalence of various skin infections caused by dermatophyte fungus



Fig. 2: A: Tinea pedis in toe web; B: Tinea capitis showing scarring, alopecia; C: Tinea unguium of the nail plate

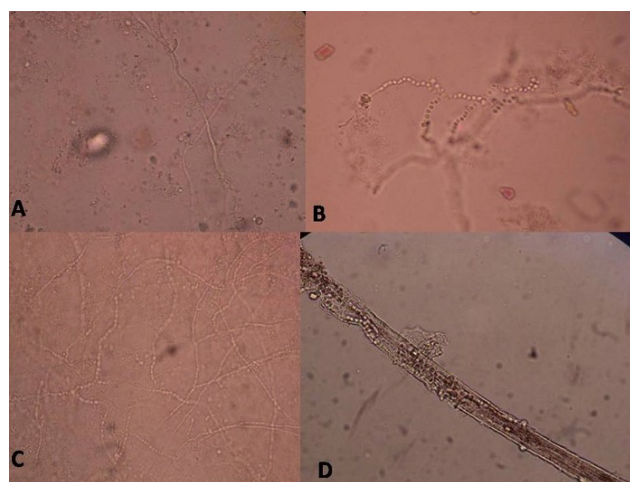


Fig. 3: A,B,C: Thin, hyaline, septate branching hyphal forms with chains of arthroconidia; D: Endothrix infection with arthroconidia (KOH mount, 40X magnifications)

because it may be representing the population sample, which may show an association with risk factors for infection.¹⁷ Identification of the fungus for dermatophytosis is not define only the epidemiology but also focus therapeutically when treatment is advised for the same. As variation was found in weather, noted in this region summer as well as winter which may support by environmental factors as temperature and humidity conducive for dermatophyte infection. The study was found 70.92% positive cases for various fungal agents in comparison to other studies recorded. The finding of higher incidence of the disease in this region due to the environmental conditions may also include the nature of work, the major population involve with manual labor, agriculture work and livestock rearing and poor individual

Table 1: Percentage of clinical conditions with reference to clinical presentation and sex

Clinical manifestation	Total no of sample [n, %]	Sex	
		Male (%)	Female (%)
<i>Tinea corporis</i> *	766 (50.39%)	517 (67.49)	249(32.51)
<i>Tinea capitis</i>	57 (3.75%)	33 (57.89)	24 (42.15)
<i>Tinea cruris</i>	225(14.80%)	207(92)	18(8)
<i>Tinea pedis</i>	161(10.59%)	84(52.17)	77(47.83)
<i>Tinea barbae</i>	23 (1.51%)	23 (100)	0
<i>Tinea imbricata</i>	0 (0%)	0	0
<i>Tinea versicolor</i>	20 (1.32%)	8(40)	12(60)
<i>Tinea unguium</i>	84 (5.53%)	41(48.81)	43(51.19)
<i>Tinea fasciae</i>	132 (8.68%)	80(60.61)	52(39.4)
<i>Tinea nigra</i>	52 (3.42%)	32(61.54)	20(38.46)
	n = 1520	1025(67.43)	495 (32.57)

*Tinea corporis showed highest in males than females

Table 2: Distribution in various age groups

Age group	% prevalence
5-15 years	203 (13.36%)
16-30 years*	668 (43.95%)
31-45 years	341 (22.43%)
46- 60 years	196 (12.89%)
> 60 years	112 (7.37%)
	n = 1520

*Higher prevalence showed in 16-30 years age group

Table 3: Direct microscopy and culture in relation to clinical types of tinea

Clinical manifestation	Total number	KOH positive	Culture positive
<i>Tinea corporis</i> *	766	463 (60.44%)	501(65.40%) *
<i>Tinea capitis</i>	57	43 (75.44%)	51 (89.47%)
<i>Tinea cruris</i>	225	176 (78.22%)	189(84%)
<i>Tinea pedis</i>	161	102 (63.35%)	113(70.19%)
<i>Tinea barbae</i>	23	13 (56.52%)	18(78.26%)
<i>Tinea imbricata</i>	0	0	0
<i>Tinea versicolor</i>	20	12 (60%)	16(80%)
<i>Tinea unguium</i>	84	76 (90.48%)	80(95.24%)
<i>Tinea fasciae</i>	132	76 (57.58%)	84(63.64%)
<i>Tinea nigra</i>	52	20 (38.46%)	24(46.15%)
Total	1520	981(64.54%)	1076(70.79%)

*Culture positivity was found more than KOH positive in *Tinea corporis*

hygiene for long time predisposes to maintain the skin infection intermittently and it could be finding as an agreement regarding the disease in majority.^{18,19} It is also finding out an approach regarding a common practice among the local population to take irregular medication or unavailability of medication leading to delay in proper treatment which an important cause to induce interfamilial cases and spread of infection in the society.

Individual sex in our study was found male (67.43%) than the females (32.57%) which was found as other studies.^{9,18–22} Males were found more due to hard physical labor, donning of shoes for long time and tight-fitting cloths and working under hot as well as humid environment leads to excessive sweating which promotes for fungal infection.

Among dermatophytosis *tinea corporis* (50.39%) were found higher than *tinea cruris* (14.80%) and *tinea pedis* (10.59%) which showed similarity with other studies in India.^{20,23,24} But in other study found in *tinea corporis* (39.1%) followed *tinea cruris* (27.0%),²² 36.2%⁹ where may be due to less aeration owing to tight clothing, maceration, working under hot and humid environment which provoke sweating in groin, waist, underarm and toe web making the sites more permeable to infection.²⁵ Males were found major cause of concern for *Tinea cruris* and also showed similarity with other studies.

Among the clinical condition *Tinea capitis* (3.75%) fungal organism was found *Trichophyton violaceum* in majority which may be due to sharing of caps, scarf and

Table 4: Spectrum of isolation of dermatophytes

Isolate	% prevalence
No growth	440 (28.95%)
<i>T. mentagrophyte</i>	329 (21.64%)*
<i>T. rubrum</i>	51 (3.36%)
<i>T. mentagrophyte var interdigitale</i>	82 (5.39%)
<i>T. violaceum</i>	36 (2.37%)
<i>T. soudanense</i>	37 (2.43%)
<i>T. schoenleinii</i>	17 (1.12%)
<i>T. tonsurans</i>	18 (1.18%)
<i>T. verrucosum</i>	8 (0.53%)
<i>T. species</i>	95 (6.25%)
<i>M. audouinii</i>	9 (0.59%)
<i>M. gypseum</i>	16 (1.05%)
<i>M. canis</i>	9 (0.59%)
<i>M. species</i>	47 (3.09%)
<i>E. floccosum</i>	24 (1.58%)
Non dermatophyte	254 (16.71%)
Unidentified	48 (3.16%)
Total	1520

**T. mentagrophyte* showed higher prevalence as dermatophyte.

Table 5: Isolates in relation to various clinical types

Clinical manifestation	*Tinea corporis	Tinea capitis	Tinea cruris	Tinea pedis	Tinea barbae	Tinea imbricata	Tinea versicolor	Tinea unguium	Tinea fasciae	Tinea nigra
NG	268	4	36	48	4	0	4	4	44	28
T. ment*	168	0	90	24	4	3	0	12	32	0
T. rub	19	0	8	8	0	0	0	16	0	0
T. inter	28	1	12	21	0	0	0	12	8	0
T. viol	0	28	0	0	0	0	0	0	8	0
T. soud	19	0	6	0	0	0	0	0	12	0
T. scho	12	0	1	4	0	0	0	0	0	0
T. ton	8	0	0	4	2	0	0	4	0	0
T. verru	0	0	8	0	0	0	0	0	0	0
T. spp	33	4	32	4	10	0	0	0	12	0
M. audo	4	0	5	0	0	0	0	0	0	0
M. gyp	12	0	0	4	0	0	0	0	0	0
M. cani	4	0	0	4	1	0	0	0	0	0
M. spp	20	0	11	4	0	0	0	4	8	0
E. flo	12	0	8	4	0	0	0	0	0	0
Non derma	123	20	4	32	3	0	16	24	8	24
UD	36	0	4	0	0	0	0	8	0	0

*Clinical correlation found *T. mentagrophyte* higher no. of isolate in tinea corporis

combs among children. *T. violaceum* is an Anthrophilic fungus it spreads by contact between persons.⁷ A Study conducted in Nepal has shown a prevalence with 4.6%.²⁶ While the other studies from India recorded low prevalence, which was attributed to apply mustard oil over the scalp. However similar studies found no significant value.^{18,19}

A fungal isolate as dermatophyte can represent different clinical manifestations i.e. *T. mentagrophyte* which was found being the major isolate. Different clinical types of tinea or a single clinical type like tinea corporis found several etiological agents.

In our study *T. mentagrophyte* was isolated as a commonest etiological agent and similarly found in study of Bhatia & Sharma, 2014 but in other study found commonest etiological agent *Trichophyton verrucosum*^{9,27} and an anthrophilic fungi¹⁵ its high incidence recorded may be due to nature of work, interaction with people. People live in close contact directly or by using the same material used by other individual lead to spread of fungal infection¹⁸ and living with domestic animals prone to transmit the Geophilic as well as Zoophilic dermatophytes like *Microsporum* species as *gypseum* & *canis* and *Trichophyton* species as *verrucosum*, *rubrum*

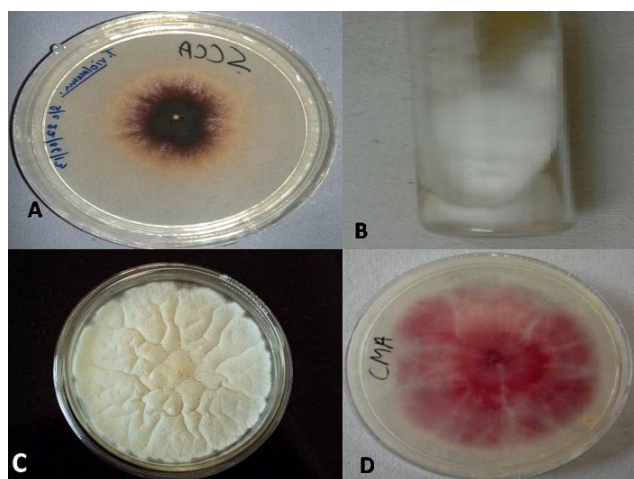


Fig. 4: A,B&C: Obverse macroscopic morphology of *T.violaceum*, *T.mentagrophyte* & *M.audouinii*; D: Reverse macroscopic colony morphology of *T.rubrum*

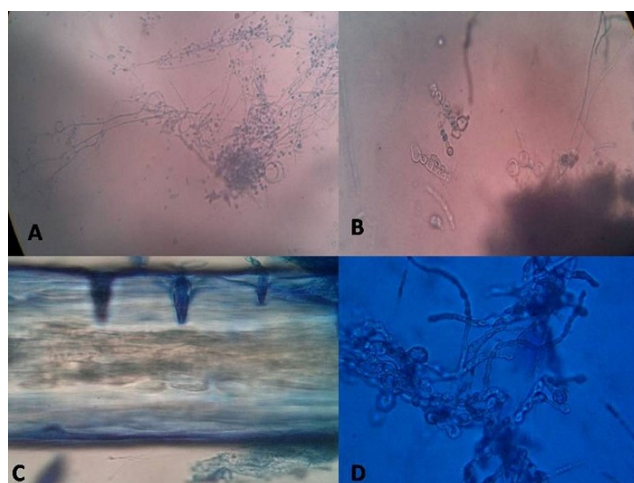


Fig. 5: A,B&D: Micromorphology of *T.mentagrophyte*, *T.violaceum* & *M. audouinii*; C: Positive hair perforation test showing by *T.mentagrophyte*

(3.36%) & variants of *mentagrophyte* were isolated which was less in comparison to other studies conducted in India. *Trichophyton soudanense* (2.43%) and *Trichophyton schoenleinii* (1.12%) have also been isolated. In other study *T. schoenleinii* has more often been an isolate from case of favus¹¹ but in our study it was found from tinea corporis. *T. verrucosum* (0.53%) was isolated from tinea cruris found low incidence but worldwide recorded as a dominant species.^{10,28,29} Out of total dermatophyte isolates, 1.58% *E. floccosum* was found in our study but few Indian studies *E. floccosum* as one of the dermatophytes was isolated^{12,30}. Few species of Microsporum were *M. gypseum* (1.05%), *Microsporum audouinii* (0.59%) (Figure 4 C & Figure 5 D) and *M. canis* (0.59%) isolated as these are Zoophilic and Geophilic fungi.⁷

Isolates as Non dermatophytes (16.71%) were isolated considerably as contaminant those were reported from infected patients which may colonize tissues and cause secondarily tissue destruction. In another study they may causing cutaneous infection but is not yet proven and role as pathogen primarily by non-dermatophyte was controversial.⁹

In our study direct microscopy showed various fungal elements in 64.54% cases and culture was positive in 70.92%. Which may be due to presence of fungal elements in very less amount in the sample visualized by direct microscopy after KOH mount and which was found false negative approx. in 5 to 15% specimens of infected patients considered as an ordinary practice¹ and in culture procedure high positivity may found by use of selective culture media as SCCA and DTM which inhibit the growth of contaminant.

The infection out of different age group, 16-30 years age (43.95%) patients were found higher than other age group, similarly in other study (Kumar U, 2019). This may be due to working in higher variable environmental conditions. The infection was more prominent due to low socioeconomic status, poor hygienic conditions and working in climate changing in rural areas. Similarly found in study of Upadhyay V in 2019. The finding of higher incidence of the disease in this region due to the environmental conditions may also include the nature of work, the major population involve with manual labor, agriculture work and livestock rearing and poor individual hygiene for long time predisposes to maintain the skin infection intermittently and it could be finding as an agreement regarding the disease in majority.^{18,19}

5. Conclusion

The study was concluded tinea corporis higher than other clinical conditions as the of dermatophytosis and found males predominantly which followed by tinea cruris and pedis in this region. Overall, the study was found most predominant fungus *T. mentagrophyte*. And study also suggest that the fungal cultures are mandatory to rule out false positivity of result and to improve the diagnosis of suspected dermatophytosis for the further effective treatment without interruption of medication. Also, the infections may not be treated proper due to irregular or undefined medication, working in higher variable environmental conditions. The infection was more prominent due to low socioeconomic status, poor hygienic conditions and working in climate changing in rural areas.

6. Source of Funding

None.

7. Conflict of Interest


The authors declare no conflict of interest.

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