Epidemiology and clinico-mycological profile of adult patients with Dermatophytosis, in a teaching hospital

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Abstract

Background: Dermatophytosis is the most common superficial fungal infection also called as 'ringworm' or 'tinea'. Prevalence of dermatophytosis in patients attending dermatology outpatient department (OPD) was 13% in India. Current study was undertaken in view of changing infection trends.
Objectives:
1) To know epidemiology of adult patients with dermatophytosis.
2) To know the distribution of clinical types by direct microscopy (Potassium Hydroxide mount/KOH mount) and culture.
3) To identify the causative fungal agents in various clinical types of dermatophytosis.
Material and methods: Cross sectional study was done in adult patients attending dermatology OPD during September 2019 to January 2020. Sample size calculated to be 102. Purposive sampling method was used. Skin scrapings, nail clippings and infected hair stubs were collected and subjected to microscopy and culture. Hair perforation test and urease test when required were done. Data on sociodemographic profile, clinical type and microbiological finding were recorded. Data analysed using SPSS version 20. Chi-square test was used.
Results: Tinea corporis (34/33.3%) was the commonest clinical type followed by tinea cruris (27/26.5%). Male to female ratio was 2.4:1. Dermatophytosis was significantly high in patients with lower middle class and lower class (56.9%) and in rural area (57.8%). Trichophyton. rubrum (31/54.4%) was the commonest aetiological agent isolated. Out of 102 cases, 78(76.5%) and 57(55.9%) cases were positive for fungi, by microscopy and culture. Conclusions: Tinea corporis (34/33.3%) was the commonest clinical type. Poverty and poor hygiene was significantly associated with dermatophytosis. Trichophyton. rubrum (31/54.4%) was the commonest aetiological agent.

Keyword: Dermatophytosis, adult patients, epidemiology, clinico-mycological profile

Introduction

Dermatophytosis is the most common superficial fungal infections caused by dermatophytes, which are capable of growing by invading the keratinized tissues such as skin, hair and nail in humans [1]. Dermatophytes are hyaline septate molds. Dermatophytes are divided into three main genera based on their morphological characteristics-Trichophyton, Microsporum, Epidermophyton. They are normally confined to non-living or dead cornified layer of epidermis as they are unable to penetrate living tissue of the host [2].

These infections are also referred to as 'ringworm' or 'tinea' and classified according to body sites involved. Traditionally, infections caused by dermatophytes have been named according to the anatomic locations involved by appending the Latin term designating the body site after the word tinea, e.g., tinea capitis for ringworm of the scalp [3]. The clinical manifestations are as follows:

i)   Tinea barbae (ring worm of the beard and moustache).
ii)   Tinea capitis (scalp, eyebrows and eyelashes).
iii)   Tinea corporis (glabrous skin).
iv)   Tinea cruris (groin).
v)   Tinea favosa (favus).
vi)   Tinea imbricata (ringworm caused by *T. concentricum*).
vii)   Tinea mannum (hand).
viii) Tinea pedis (feet).
ix)   Tinea unguium (nails) [4].

The incidence of specific dermatophyte species in a particular region varies with time due to population movement; mass migration and travel, economic status and level of hygiene, culture, traditions and habits, ecology and environment and changing therapies [5-6].

Prevalence of dermatophytosis in patients attending dermatology OPD was 13% in India [7]. Hot and humid climate in tropical and subtropical countries like India makes dermatophytosis a very common superficial fungal infection. Other factors like poverty, poor hygiene and social conditions such as overcrowding contribute to dermatophytosis in India [1].

A correct clinical diagnosis is important to manage appropriately. Clinical diagnosis of dermatophytosis needs to be supported by laboratory diagnosis, and culture for definitive identification of etiological agent. Current study was undertaken to know the epidemiology, distribution of clinical types and identification of causative agents, to understand the changing infection trends which will be helpful to decide on appropriate management.

Objectives

1)   To know epidemiology of adult patients with dermatophytosis.
2)   To know the distribution of clinical types by direct microscopy (Potassium Hydroxide mount/ KOH mount) and culture.
3)   To identify the causative fungal agents in various clinical types of dermatophytosis.

Methodology

A cross sectional study was done in adult patients attending dermatology outpatient department (OPD) of a teaching hospital during September 2019 to January 2020.

Inclusion criteria

Adult patients of either sex with superficial infections of skin, hair and nails, clinically diagnosed as dermatophytosis, with no prior history of use of antifungal medication were included in the study

Exclusion criteria

Patients <18 years, or on treatment for dermatophytosis were excluded from the study.

Sample size calculation and sampling method
Sample size was calculated using formula for finite population.
Where, Z α is the standard normal deviate, which is equal to 1.96 at 95% confidence interval.
p = Prevalence of dermatophytosis, 13% in dermatology OPD. [7] Hence p = 0.13, 1-p = (1-0.13).

$$Sample\ size(n) = \frac{\frac{z^2 X\ p(1-p)}{e^2}}{1+\frac{z^2 X\ p(1-p)}{e^2 N}}$$

e = Absolute precision taken as 3% (<5 is acceptable).
N = Population to be studied (patients with dermatophytosis during study period) = 524.

$$Sample\ size(n) = \frac{\frac{(1.96)^2 X\ 0.13(1-0.13)}{(0.03)^2}}{1+\frac{(1.96)^2 X\ 0.13(1-0.13)}{(0.03)^2\ 524}}$$

Sample size calculated using above formula n=101.4 equals to 102.
Purposive sampling method was used.

Data collection: Institutional ethical committee clearance and informed consent from patients were obtained. Data on sociodemographic profile, clinical type (based on clinical examination) and microbiological finding (by direct microscopy and culture also special tests like hair perforation test and urease test when needed) of dermatophytosis were recorded.

Procedure: Depending on the lesions, specimens like skin scrapings, nail clippings and infected hair stubs were collected (after cleansing affected area with 70% alcohol) and subjected to direct microscopic examination (10% potassium hydroxide (KOH) for skin and hair and 20% for nail) and culture in set of 3 media
1) Sabourauds dextrose agar (Modified).
2) Sabourauds dextrose agar with 0.5% cycloheximide and 0.05% chloramphenicol (to avoid contamination with saprophytic fungi and bacteria).
3) Dermatophyte Test Medium (DTM).

Fungal growth were identified based on colony morphology, pigmentation, growth rate, microscopy (Lactophenol Cotton Blue mount), and slide culture. Special tests like, hair

perforation test and urease test for identification of species when required were done.

Data analysis: Data analysed for 102 patients. Data was entered in Microsoft excel and

analysed using SPSS version 20. Data represented in frequency and proportions. Statistical analysis was done using chi square test and $P<0.05$ was considered as statistically significant

Results

Among 102 patients dermatophytosis affecting skin, hair and nail were 73 (71.5%), 17(16.7%) and 12(11.8%) respectively. Tinea corporis (34/33.3%) was the most common clinical type of dermatophytosis identified on clinical examination followed by tinea cruris (27/26.5%), tinea unguium (12/11.8%), tinea capitis (11/10.8%), tinea barbae (6/5.9%), tinea faciei (5/4.9%), tinea pedis (5/4.9%) and tinea mannum (2/2%) (Shown in figure 1).
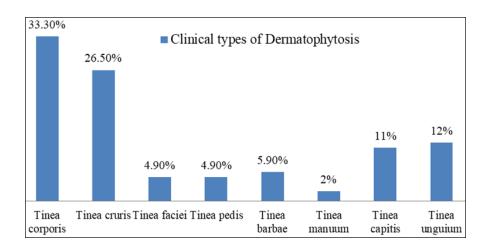

Fig 1: Distribution by Clinical types of dermatophytosis on Clinical examination

Most common age group affected with dermatophytosis was 18-40 years (76.5%). Skin being affected commonly in all the age groups compared with hair and nail but was not statistically significant. Dermatophytosis was predominant in males (65.7%) compared to females (34.3%). Male to female ratio was 2.4:1. Proportion of males with skin infection was similar compared to females, where as hair infection was higher in males and nail infection was higher in females, but was not statistically significant. Dermatophytosis was more common in patients belonging to lower middle class and lower class (56.9%), affecting the skin commonly, which was statistically significant. Dermatophytosis was more common in patients who studied up to secondary school (38.2%) followed by primary school (32.4%). Dermatophytosis was more common in people residing in rural area (57.8%) which was significant (table 1).

Table 1: Distribution of dermatophytosis by socio-demographic data

Socio-demographic	Dermatophytes affecting the following			Total	X^2/p

variable	Skin* (73/71.5%)	Hair# (17/16.7%)	Nail$ (12/11.8%)	(102)	value
Age Group					
18-40 years	56(71.8%)	13(16.7%)	9(11.5%)	78(76.5%)	1.1454/ 0.887005
40-60 years	13(65%)	4(20%)	3(15%)	20(19.6%)	
>60 years	2(50%)	1(25%)	1(25%)	4(3.9%)	
Gender					
Male	52(72.2%)	13(18.1%)	7(9.7%)	72(70.6%)	1.166/ 0.558221
Female	21(70%)	4(13.3%)	5(16.7%)	30(29.4%)	
Socioeconomic status as per BG Prasad's classification (based on per capita monthly income)					
Upper class and upper middle class	6(54.5%)	2(18.2%)	3(27.3%)	11(10.8%)	15.5323/ 0.003715
Middle class	17(51.2%)	10(30.3%)	6(18.2%)	33(32.3%)	
Lower middle class and lower class	50(77.5%)	5(8.6%)	3(5.2%)	58(56.9%)	
Literacy status					
Illiterate	6(50%)	3(25%)	3(25%)	12(11.8%)	8.3766/ 0.211793
Primary school	20(62.5%)	8(25%)	4(12.5%)	32(31.4%)	
Secondary school	30(76.9%)	5(12.8%)	4(10.3%)	39(38.2%)	
Undergraduate and post graduate	17(89.5%)	1(5.3%)	1(5.3%)	19(18.6%)	
Residence					
Rural	50(84.7%)	5(8.5%)	4(6.8%)	59(57.8%)	11.9871/ 0.002495
Urban	23(53.5%)	12(27.9%)	8(18.6%)	43(42.2%)	

* Tinea corporis, tinea cruris, Tinea pedis, Tinea faciei, Tinea mannum.

#Tinea barbae, Tinea capitis.
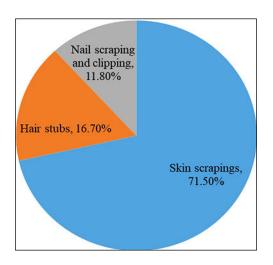
$Tinea unguium.

Fig 2: Distribution by types of samples collected

Out of 102 clinical samples collected 73(71.5%) were skin scrapings, 17(16.7%) were hair stubs and other 12(11.8%) were nail scrapings and clippings. (Figure 2).

Table 2: Distribution of clinical types by direct microscopy (Potassium Hydroxide mount/KOH mount) and culture

Clinical Type	Direct microscopy (KOH mount)		Total cases n=102 (100%)	Culture		Total cases n=102 (100%)
	Positive (78/76.4%)	Negative (24/23.4%)		Positive (57/56.9%)	Negative (45/43.1%)	
Tinea corporis	28	6	34 (33.3%)	25	9	34 (33.3%)
Tinea cruris	21	6	27(26.5%)	15	12	27(26.5%)
Tinea faciei	4	1	5(4.9%)	2	3	5(4.9%)
Tinea pedis	3	2	5(4.9%)	1	4	5(4.9%)
Tinea mannum	4	2	6(5.9%)	3	3	6(5.9%)
Tinea barbae	1	1	2(2%)	2	0	2(2%)
Tinea capitis	8	3	11(10.8%)	6	5	11(10.8%)
Tinea unguium	9	3	12(11.8%)	3	9	12(11.8%)

Out of 78 cases which were positive on direct microscopy, most common were tinea corporis (28) and tinea cruris (21). Tinea faciei, tinea pedis, tinea mannum, tinea barbae, tinea capitis and tinea unguium showed KOH positivity in only 4, 3, 4, 1, 8 and 9 cases respectively. Out of 57 cases which were cultures positive 25 and 15 were tinea corporis and tinea cruris respectively. Tinea faciei, tinea pedis, tinea mannum, tinea barbae, tinea capitis and tinea unguium showed culture positivity in only 2, 1, 3, 2, 6 and 3 cases respectively (table 2).

Table 3: Comparison of results obtained in the direct microscopic examination and culture

Culture	Number of cases		Total
	KOH+ve	KOH-ve	
Culture positive	51	6	57(55.9%)
Culture negative	27	18	45(44.1%)
Total	78(76.5%)	24(23.5%)	102

Out of 102 clinically suspected cases of dermatophytosis. Fungi was demonstrated in 78 cases by direct microscopy, 51(50%) cases were positive by both microscopy and culture. 27(26.5%) cases were positive by microscopy and negative by culture. 6 (5.9%) cases were negative by microscopy but culture positive (table 3).

Table 4: Clinical type of dermatophytosis in relation to causative fungal agent

Clinical Type	Causative Fungal Agent	Total (n = 57/100%)

	Trichophyton rubrum (31/54.4%)	Trichophyton mentagrophyte (19/33.3%)	Trichophyton tonsurans (4/7%)	Microsporum gypseum (3/5.3%)	
Tinea corporis	15	10	0	3	25
Tinea cruris	9	6	0	0	15
Tinea faciei	2	0	0	0	2
Tinea pedis	1	0	0	0	1
Tinea manuum	3	0	0	0	3
Tinea barbae	1	1	0	0	2
Tinea capitis	0	2	4	0	6
Tinea unguium	3	0	0	0	3

Out of 102 cases causative fungal agent was identified in only 57 cases. Trichophyton rubrum (31/54.4%) was the most common causative fungal agent isolated, 15 of which were from tinea corporis 9 from tinea cruris, 2, 1, 3, 1 and 3 from tinea faciei, tinea pedis, tinea mannum, tinea barbae and tinea unguium respectively. Trichophyton mentagrophyte (19/33.3%) was isolated from 10, 6, 1 and 2 cases of patients with tinea corporis, tinea cruris, tinea barbae and tinea capitis respectively. Trichophyton tonsurans (4/7%) was isolated only from 4 cases of patients with tinea capitis and the least common aetiological agent was Microsporum gypseum with 3 cases isolated from tinea corporis (shown in Table 4).

Discussion

In the current study, 102 clinically diagnosed cases of dermatophytosis attending dermatology outpatient were studied.

In the present study, tinea corporis was the commonest clinical type encountered (33.3%) followed by tinea cruris (26.7%) where as in study by Srinivasan et al. it was 35.4% and 16.76% and in study by Surendran K et al. they were 44.3% and 38.2% respectively [8-9]. In this study tinea faciei was present in 5(4.9%) cases which was slightly low when compared with study done by Srinivasan et al. 7.3% [8]. In our study, tinea unguium was found in 11.8% of cases which was high when compared to study done by Doddamani et al. (9.5%) [1]. In the current study, tinea capitis was seen in 10.8%, where as in study done by Srinivasan et al. it was 16.6% [8]. In study by Sudha M et al., 7(5.4%) had Tinea faciei, 5(5.4%) had Tinea capitis and 7(5.4%) had Tinea unguium [10]. Out of 102 cases in this study, tinea pedis was seen in 4.9% of cases, where as in study by Sudha M et al. it was 3.5% [10]. In the present observation, 2 cases (2%) had tinea mannum which was comparable with study done by Sudha M et al. it was 2.3% [10]. Present study reveals that, tinea barbae was seen in 6 cases (5.9%), where as Kumar et al. has reported tinea barbae in (1.2%) cases [11].

The present study shows dermatophytosis was more common in the age group 18-40 years (76.5%) compatible with study by Poluri LV et al. where more number of cases were observed between age groups of 21-40 years, where as in study by Surendran K et al. it was in the age group 16-30 years (44%) [12, 9] and in study by Srinivasan B et al. clinically more in the age group of 11-20 and 21-30 years [8]. The highest incidence in young adults aged 18-40 years may be due to increased physical activity and increased degree of exposure to infection. In the present study, males (70.6%) were more commonly affected than females (29.4%).

Male to female ratio was 2.4:1, which was higher when compared with study by Noronha TM *et al.*, it was 1.63:1 [13]. Male predominance may be due to increased outdoor physical activities and increased occupational exposure to infection than females.

In this study Dermatophytosis was more common in patients belonging to lower middle class and lower class (56.9%) which was statistically significant. In study by Dammu R *et al.* majority belonged to lower class (34.36%) followed by upper lower class (28.83%) [14]. In study by Guruprasad KY *et al.* majority of patients were from lower socioeconomic class i.e. 66.8%. Remaining 33.2% were from middle class [15]. In Study by Kumar U *et al.* the maximum proportion (40.2%) of patients were from lower middle class [11]. Poverty and poor

hygiene (more in rural area) was significantly associated with dermatophytosis in this study.

In the current study out of 102 clinically diagnosed cases of dermatophytosis, 78(76.5%) cases and 57(55.9%) were positive for fungi, by KOH and culture respectively. 51 cases were positive by both KOH and culture, 27 cases were positive by KOH and negative by culture, 6 cases were negative by KOH but culture positive, 18 cases were negative by both KOH and culture. In study by Sumit kumar *et al.* Out of 250 cases of dermatophytosis, 138 cases (55.2%) were positive in direct microscopic examination (KOH) and total of 106 cases (42.4%) were positive in culture. 102 cases (40.80%) were positive in direct examination (KOH) as well as culture. In 4 cases (1.6%) direct examination was negative but they were culture positive. 108 cases (43.2%) were negative in both direct examination and culture [16]. KOH positive and culture negative could be due to non-viability of fungal elements in some cases.

In study by Mahale RP *et al.* 177 samples were processed, of which 115 (64.9%) samples were positive for fungal filaments by KOH preparation and 108 (61.01%) yielded growth. Out of the 115 KOH positive samples, 14 samples did not yield growth, however 7 samples were negative for fungal filaments by KOH preparation and culture positive [17].

Findings of present study shows that causative fungal agent was isolated in 57 cases of which trichophyton. Rubrum (31/54.4%) was the commonest aetiological agent in majority of clinical types followed by trichophyton. Mentagrophyte (19/33.3%), Microsporum. Gypseum (3/5.3%) and Trichophyton. tonsurans (4/7%). In study by Sumit Kumar *et al.*, out of 250 cases 106 cases (42.4%) were culture positive. Trichophyton rubrum were the commonest isolates 69(65.09%) other isolates were Trichophyton mentagrophytes 19(17.92%), Trichophyton violaceum 4(3.78%), Epidermophyton floccosum 9 (8.49%), Microsporum audouinii 59(4.72%) [16]. Also similar finding was given in study by Maity PP *et al.* where T. rubrum was the predominant agent commonly involved in etiology of dermatophytosis [18].

Conclusion

Among 102 patients dermatophytosis affecting skin, hair and nail were 73 (71.5%), 17(16.7%) and 12(11.8%) respectively. Tinea Corporis (34/33.3%) was the most common clinical type of dermatophytosis identified on clinical examination followed by Tinea Cruris (27/26.5%). Most common age group affected with dermatophytosis was 18-40 years (76.5%). Dermatophytosis was predominant in males (65.7%). Poverty and poor hygiene (more in rural area) was significantly associated with dermatophytosis in this study. In current study Out of 102 clinically diagnosed cases of dermatophytosis, 78(76.5%) cases and

57(55.9%) were positive for fungi, by KOH and culture respectively. Trichophyton. Rubrum (31/54.4%) was the commonest aetiological agent in majority of clinical types followed by Trichophyton. mentagrophyte (19/33.3%), Microsporum. gypseum (3/5.3%) and Trichophyton. tonsurans (4/7%).

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