

A Clinico-Epidemiological Study of Dermatophytosis

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Abstract

The source of infection is usually an active lesion on an animal, or on another human and transmission is either by direct contact or indirect via fomites. Fomites play an important role in transmission, especially when combined with host risk factors such as immunological status, local trauma, excessive moisture or occlusive clothing. Use of contaminated combs, caps, towels, shoes, socks, pillows, beddings, and clothing include the common methods of indirect transmission. After the detailed history, clinical examination of patient was made in good light which included site of lesion, number of lesions, types, presence of inflammatory margin and extent of involvement. Most common clinical type being 42 cases (28%) in tinea cruris, then followed by 37 cases (24.67%) in tinea corporis, 36 cases (24%) in tinea cruris with corporis, 7 cases (4.67%) in tinea capitis, 8 cases (5.33%) in tinea pedis, 4 cases (2.67%) in tinea manuum, 13 cases (83.3%) in tinea unguium and 3 cases (2%) in tinea faciei. Middle class population was the most commonly affected socio-economic group compared to other studies which show low class. This may be due to the inability of the patients to reach to this hospital from far flung areas and poor patients may prefer home remedies.

Keywords: Tinea Cruris; Tinea Capitis; Dermatophytosis

Introduction

Dermatophytes have been grouped into geophilic, zoophilic and anthropophilic species based on their ecology and host preference. Geophilic species are considered ancestral to pathogenic dermatophytes. The natural habitat of these species is the soil. These are only occasionally pathogenic for man and lower animals, with the exception of *M. gypseum*. Exposure to soil is the main source of infection. Ex: *M. gypseum*, *M. fulvum*, *T. terrestre* [1].

Zoophilic species, having developed the ability to hydrolyze keratinous debris in the soil, evolved to parasitize animals. Human infections are acquired either by direct contact with an infected animal or indirectly by contact with fomites. Ex: *M. canis*, *M. gallinae*, *M. equinum*, *T. mentagrophytes var mentagrophytes*, *T. verrucosum*.

Anthropophilic species have evolved from zoophilic species. Humans are normal hosts for these fungi and transmission may occur directly or indirectly. Ex: *E. floccosum*, *M. audouinii*, *T. mentagrophytes var rinterdigitale*, *T. rubrum*, *T. schoenleinii*, *T. tonsurans*, *T. violaceum* [2].

Distribution of the dermatophytes varies with the geographical area and during the course of time. Before 1900, in Western Europe tinea capitis was rare and was caused mostly by *M. canis*, from 1900 to mid 1950's a grey patch ectothrix type of ringworm in children caused by *M. audouinii* replaced *M. canis* due to improved standard of living and spread over the USA and Canada. This in turn is replaced by *T. tonsurans*. *T. tonsurans* and *M. canis* are now the most prevalent pathogens causing tinea capitis in North America and Europe, respectively [3].

In India, Africa and Nepal, *T. violaceum* is the main isolated fungus from children with tinea capitis. Tinea imbricate (Tokelau) caused by *T. concentricum* is geographically restricted to South Asia, China, India ('Indian or Chinese tinea'), the islands of south pacific, south and central America. The prevalence of dermatophytosis varies in India. Most of Indian studies indicate it is more prevalent in southern and eastern region than the northern regions of the country. In India the commonest species isolated are *T. rubrum* followed by *T. mentagrophytes* and *E. floccosum* [4].

The source of infection is usually an active

lesion on an animal, or on another human and transmission is either by direct contact or indirectly via fomites. Fomites play an important role in transmission, especially when combined with host risk factors such as immunological status, local trauma, excessive moisture or occlusive clothing. Use of contaminated combs, caps, towels, shoes, socks, pillows, beddings, and clothing include the common methods of indirect transmission. Infection from soil is a well-established if unusual occurrence as in case of *M. gypseum* [5].

In tinea pedis, institutions, hospitals and other modes of sharing washing facilities like showers, swimming pools, etc. play an important role in disease transmission.

Little is known about the factors that mediate adherence of dermatophytes. The kinetics of adherence to the skin or nail surface was investigated in several *Trichophyton* and *Microsporum* species, using different experimental models and microscopy techniques. These studies showed a time-dependent increase in the number of adhering spores, followed by germination and invasion of the stratum corneum by hyphae growing in multiple directions. Zurita and Hay observed that maximum adherence of *Trichophyton* spp. arthroconidia to keratinocytes in suspension occurred within 3-4 hours. In an nail plate model, adherence and germination of *T. mentagrophytes* arthrospores were observed at 6 hours and side branches at 16 hours [6].

Dermatophytes are provided with an arsenal of proteases aimed at the digestion of the keratin network into assimilable oligopeptides or amino acids. These fungi secrete multiple serine and metallo-endoproteases (subtilisins and fungalysins, respectively) formerly called keratinases. A direct relationship between keratinases and pathogenicity was established by Vianietal. They showed that, strains with the highest keratinolytic activities in vitro were responsible for the more symptomatic infections. It must finally be noted that skin damages upon dermatophytic infection can result from other processes than direct action of fungal lytic enzymes. Indeed, host proteases could possibly be activated and participate in inducing lesions.

Methodology

A total of one hundred and fifty clinically diagnosed randomly elected cases of skin, hair and nail infection, of all age groups and of both sexes, attending Dermatology out patient department were taken for the study.

The selected cases were studied as per the proforma enclosed. A detailed history of selected cases was taken in relation to name, age, sex, address, occupation, duration of illness and involvement of more than one site.

After the detailed history, clinical examination of patient was made in good light which included site of lesion, number of lesions, types, presence of inflammatory margin and extent of involvement.

Inclusion Criteria

All skin, hair and nail samples from clinically suspected cases of dermatophytosis of all ages and both the sexes.

Exclusion Criteria

- Patients who are already using antifungal agents for the disease.
- Patients with those superficial fungal infections which are not caused by dermatophytes, such as tinea versicolor, etc.

Results

Table 1: Categorical Distribution of Clinical Samples

Samples Collected	No. of samples	Percentage (%)
Skin	130	86.67
Nail	13	8.67
Hair	7	4.67
Total	150	100

Out of the total 150 samples collected, 130 were skin scrapings, 13 were nail clippings and 7 were hair stubs (Table 1).

Table 2: Age Wise Distribution of Dermatophytoses in the Study Group

Age Group (Years)	No. of cases	Percentage (%)
<10	5	3.34
11-20	28	18.67
21-30	49	32.67
31-40	24	16
41-50	24	16
51-60	14	9.34
61-70	3	2
71>	3	2
Total	150	100

A total of 150 cases were distributed between the range of 2-78 years. Mean age was 32.61 years. Most common age group affected was 21-30 years with 49 cases (32.67%) followed by 11-20 years with 28 cases (18.67%) and 31-40 years and 41-50 years

with 16 cases each (16%). Least common age group affected was >70 years with 2 case (2%) followed by 0-10 years with 5 cases (3.34%) (Table 2).

Table 3: Distribution of Male & Female Patients Among Cases of Dermatophytosis

	Males	Females	Total	M:F Ratio
No. of cases	117	33	150	3.54:1
Percentage	78	22	100	

Out of 150 cases, males were more commonly affected with 117 cases (78%) than Females, who were 33 cases (22%). Male to female ratio was 3.54:1 (Table 3).

Most common clinical type being 42 cases (28%) in *Tinea cruris*, then followed by 37 cases (24.67%) in *Tinea corporis*, 36 cases (24%) in *Tinea cruris* with corporis, 7 cases (4.67%) in *Tinea capitis*, 8 cases (5.33%) in *Tinea pedis*, 4 cases (2.67%) in *tinea manuum*, 13 cases (83.3%) in *Tinea unguium* and 3 cases (2%) in *Tinea faciei*.

Most common age group affected was 21-30 years with 49 cases (32.67%) having *Tinea cruris* with corporis as the most common clinical type (28.57%), followed by *Tinea corporis* (26.53%) then *T. cruris* (24.49%).

Tinea cruris with 12 cases (42.86%) showed a high prevalence in the age group of 11-20 years.

Tinea capitis with 2 cases (4.08%), *Tinea faciei* with 2 cases (4.08%) and *Tinea unguium* with 5 case (10.2%) showed a high prevalence in the age group 21-30 years.

Tinea pedis with 4 cases (16.67%) showed a high

prevalence in the age group 31-40 years [Graph 1].

Table 4: Socio-Economic Status of the Study Group

Socio-economic status	Number of cases	Percentage
Low income group	67	44.67%
Middle income group	76	50.67%
High income group	7	4.67%
Total	150	100

A total of one hundred and fifty clinically diagnosed patients of dermatophytosis were studied. Majority of the cases were from middle income group with 76 cases (50.67%) followed by low income group with 67 cases (44.67%) and high income group with 7 cases (4.67%) (Table 4).

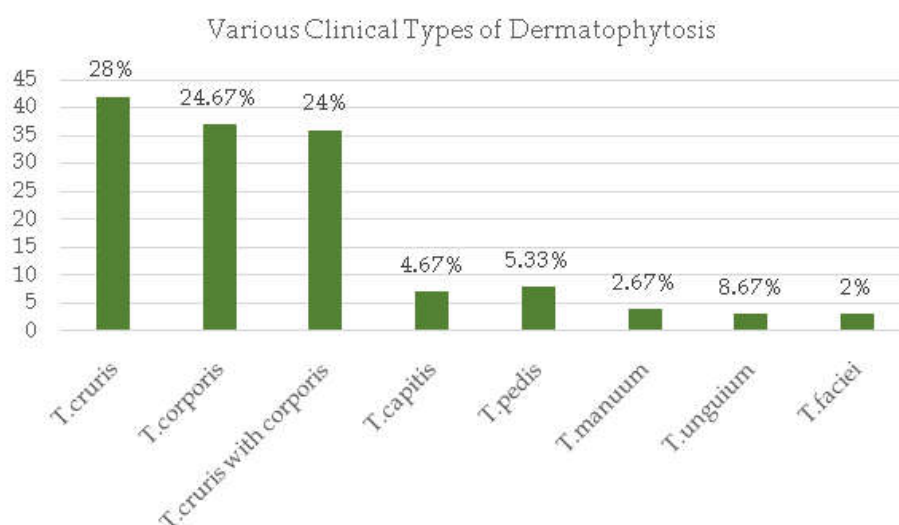
Table 5: Occupational Status of the Study Group

Occupation	No of cases	Percentage
Students	38	25.33
Manual workers	55	36.67
House-hold workers	19	12.67
Professionals	36	24
N/A(children)	2	1.33

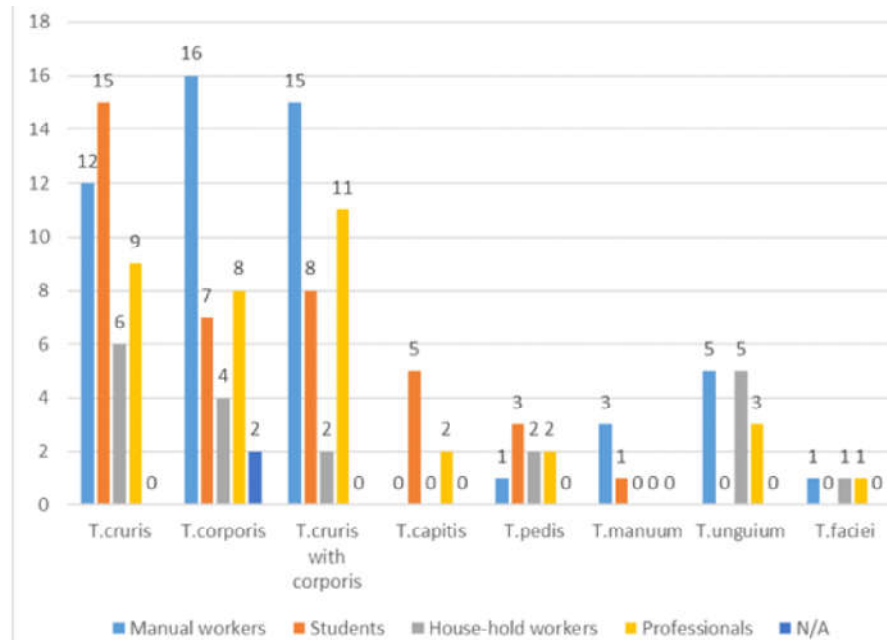
Tinea cruris was most commonly seen in students with 15 cases (35.71%) followed by manual workers with 12 cases (28.57%).

Tinea corporis was most commonly seen in manual workers with 16 cases (43.24%) followed by professionals with 8 cases (21.62%).

Tinea unguium was more commonly seen in manual workers and household workers with 5 cases (38.46%) each followed by Professionals with 3 cases (23.07%).



Graph 1: Incidence of Various Clinical Types



Graph 2: Various Clinical types in relation to occupation

Tinea capitis was more commonly seen in school going children with 5 cases (71.42%) followed by in professionals in 2 cases (28.57%).

Tinea pedis was more common in students 3 cases (37.5%), followed by household workers and professionals 2 cases each (25%).

One each cases of *Tinea faciei* were seen in manual workers, household workers and professionals (33.33%)

Three cases of *Tinea manuum* was seen in manual workers (75%) and one case (25%) with student.

Tineacorporis with *Tinea cruris* was common in manual workers with 15 cases (41.67%) followed by professionals with 11 cases (30.55%) (Table 5 and Graph 2).

Discussion

In this study, dermatophytosis was more common in the age group of 21-30 years (32.67%) followed by 11-20 years (18.67%), which is comparable with other studies done by Sen SS. et al., Sahai S. et al. and Peerapur BV. et al. whereas Veer P et al., Madhuri JT. et al., Jain N. et al. reported that the most common age group was 31-40 years. Singh S. et al. reported maximum cases in the age group of 16-30 years followed by 31-45 years.

Table 6: Age Distribution as Found in Various Studies (in percentage)

Name of the author, year and place	Commonest age group (percentage)
Bokhari MA. et al. [7], 1999, Lahore	20-40 years (36%)
Madhuri JT. et al. [8], 2002, Visakapatnam	21-40 years (59.8%)
Singh S. et al. [9], 2003, Gujarat	16-30 years (31.36%)
Sen SS. et al. [10], 2006, Guwahati	21-30 years (44%)
Veer P. et al. [11], 2007, Aurangabad	31-40 years (39.4%)
Jain N. et al. [12], 2008, Jaipur	31-40 years (23.33%)
Sahai S. et al. [13], 2011, Lucknow	21-30 years (32.4%)
Present study	21-30 years (32.67%)

The higher incidence in adults aged 15-40 years could be due to greater physical activity with increased sweating and increased opportunity for exposure.

In the present study, males (78%) were more commonly affected than females (22%). Male to female ratio was 3.54:1, which is comparable with previous studies by Karmakar S. et al., Huda M. et al., Bindu V. et al., Sumana V. et al. and Sen SS. et al., whereas Bhokari MA. et al. and Madhuri JT. et al. reported that females were commonly affected than males, with male to female ratio being 1:2.6 and 1:1.08 respectively (Table 6).

Table 7: Sex Distribution In Earlier & Present Studies

Name of the author, year and place	Male to Female ratio
Karmakar S. et al. [14], 1995, Rajasthan	2:1
Huda MM. et al. [15], 1995, Assam	1.86:1
Bokhari MA. et al. [7], 1999, Lahore	1:2.6
Bindu V. et al. [16], 2002, Calicut	2.06:1
Madhuri JT. et al. [8], 2002, Visakapatnam	1:1.08
Sumana V. et al. [17], 2004, Khammam	3:1
Sen SS. et al. [10], 2006, Guwahati	2.85:1
Welsh O. et al. [18], 2006, Mexico	3.5:1
Present study	3.54:1

Male predominance could be due to increased outdoor physical activities and increased opportunity for exposure to infection than females.

In the present study, tinea cruris was the commonest clinical type (28%) and commonest age group affected was 21-30 years (24.49%) and 11-20 years (42.86%) with 12 cases in each group. Males (83.33%) were more commonly affected. Above findings are comparable with previous studies done by Keyvanpakshi et al. and Karmakar S. et al.

In the present study, *Tinea corporis* was the second most common clinical type encountered (24.67%) and the commonest age group affected was 21-30 years (26.53%). Males (78.37%) were predominantly affected than females (21.62%). These findings are comparable with study done by Karmakar S. et al. and in contrast to other studies done by Bindu V. (54.6%), Singh S. et al., Sen SS. et al. (48%) and Jain Neetu (37%), where *T. corporis* forms the most common clinical type.

In the present study, *Tinea corporis* with *Tinea cruris* was present in 24% cases, which is comparable with the study of Peerapur BV Karmakar S (10.4% cases), whereas Siddappa K reported *Tinea corporis* with *Tinea cruris* in 0.77% cases.

In the present study, *Tinea capitis* was more commonly seen in the age group of 0-20 years (71.4%), which is comparable with other studies done by Siddappa K. (77.78%), Reddy BSN. (73.5%) and Kalla G. (85.5%). It was recorded that all the seven cases of *Tinea capitis* were seen in males. A higher incidence in females was reported by Reddy BSN. (60.3%), Jha NB. (65.2%) and Grover Chander (51.4%), whereas Kalla G. reported a higher incidence among males (M/F ratio: 1.8:1).

High occurrence of *Tinea capitis* in younger age groups may be due to lack of secretion of fungistatic sebum by scalp before puberty.

Female preponderance of *Tinea capitis* reported by several workers may be due to hormonal changes, closeness to children, more visits to hairdresser,

whereas the reported higher incidence in males may be due to the custom of irregular application of vegetable oils over the scalp compared to the female counterparts, which has fungistatic properties.

In the present study, out of 150 cases, *Tinea pedis* was seen in 5.33% cases, which is comparable with the study done by Karmakar S. (2%) and Bindu V. (3.3%), whereas Huda MM. and Singh S. in their study on dermatophytosis, reported *Tinea pedis* in 7% and 11.53% cases respectively.

In the present study, out of 150 cases of dermatophytosis, *Tinea manuum* were 4 cases (2.67%), which is comparable with other studies done by Siddappa K. (1.53%) and Huda MM. (3%).

In the present study, *Tinea unguium* was more common in females. Male to female ratio was 1:1.2, which is in contrast with other studies done by Grover S and Vijaya D. et al., whereas Bokhari MA. and Madhuri JT. in their study reported that females were commonly affected than males, with male to female ratio being 1:2.6 and 1:1.08 respectively which are similar to present study.

In the present study, tinea faciei was seen in 2% cases, which is comparable with other studies done by Huda MM. (1% cases) and Singh S. (1.58% cases) whereas Karmakar S. has reported *Tinea faciei* in 6% cases.

In the present study, infection was most common in middle income group 50.67% followed by low income group 44.67% and high income group 4.67%. Similar findings were seen with Sarma S et al, Bindu V. and Agarwal US. et al. This was in contrast to the observations of Ranganathan S. et al. who reported that 69.2% of infected people were from low income group and 23.2% from middle income group.

The reason for this could be due to the inability of the patients to reach to this hospital from far flung areas or poor patients may prefer home remedies or the patients seek advice only for inflammatory type of dermatophyte lesions. And students from many nearby residential schools could be the probable reasons for the above findings.

In the present study, dermatophytosis was most commonly seen in manual workers 55 (36.67%), which included agricultural workers and manual labourers, followed by students 38 (25.33%), professional workers 36 (24%) which included professionals, service and business class workers, then house hold workers 19 (12.67%) which includes house wives, maids and service women and 2 cases (1.33%) of toddlers.

The above findings are comparable with the observations of Veer P. et al. and Sumana V. et al. This could be due to increased physical activity and opportunity for exposure in case of manual workers and increased wet work in case of housewives.

The incidence of dermatophytosis in this study was found to be maximum during the months, June to September (38.64%), followed by January to March (28.42%), which is similar to the findings of Kalla G. et al. and Sumana V. et al.

The higher incidence during monsoon, post-monsoon months could be due to increased humidity and moisture. Lower incidence in extreme summer and winter could be attributed to the dry, arid climate during this period of the year (Table 7).

Conclusion

Most commonly affected age groups were the second and third decades, which may be due to the bulk of students and manual workers in the study who are involved with physical activities, exposure to occupational trauma, long-hours of sitting and unhygienic behaviours.

The epidemiology of dermatophyte infections may change with time, and studies as the present one, provide knowledge on the present status of the disease in a particular geographic region.

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