International Journal of Research in Dermatology
Munusamy R et al. Int J Res Dermatol. 2021 May;7(3):429-434
http://www.ijord.com

DOI: https://dx.doi.org/10.18203/issn.2455-4529.IntJResDermatol20211704

Original Research Article

A clinical and mycological study of dermatophytosis in a tertiary care hospital

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Received: 24 February 2021
Accepted: 03 April 2021

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ABSTRACT

Background: With changing climatic conditions, socio-demographic profile, economic conditions and occupational profile of the population, the profile of the dermatophyte infections is also changing. Hence, the study was done to find out the prevalence of various clinical pattern of dermatophytosis and correlate the clinical diagnosis with KOH positivity and fungal culture positivity.
Methods: This prospective observational study was conducted in a tertiary care hospital, Puducherry. The study included patients presenting to the dermatology outpatient department with skin lesions suggestive of dermatophyte infections between January 2016 to July 2017. The KOH test and fungal culture were done.
Results: The mean age of the patients was 33.65±11.61 years, with the majority belonging to 16 to 30 years of age group. There was a high male preponderance 72% with male:female ratio of 2.57:1. The most common clinical diagnosis was *Tinea corporis* in 47.50% of the population., followed by *Tinea Unguium* in 28% and *Tinea cruris* in 19.50%. KOH positivity was seen in 86 (43%) out of 200 cases in the study population. The culture was positive in 55 (27.50%) of the study population. The most common organism isolated in culture was *Trichophyton mentagrophyte* (10%), followed by *Trichophyton rubrum* (9.5%) and *Trichophyton tonsurans* (5.5%). 55 (27.5%) of the people had both culture and KOH positive.
Conclusions: Dermatophyte infections commonly affect the young and economically productive age group of 16 to 30-year, with high male preponderance. KOH tends to show a higher proportion of positivity as compared to culture.

Keywords: Dermatophytosis, Dermatophyte, Tinea, Trichophyton

INTRODUCTION

Around the globe, the most common fungal agents which have been linked with superficial infections of the skin are dermatophytes.[1] Dermatophytosis is an ailment which is characterized by infection of tissues which are keratinized like the epidermis, the nails or the hair.[2] The aetiology of this disease is especially a group of fungi which are filamentous and closely related to each other. These organisms called dermatophytes comprise of the genera of *Epidermophyton*, genera of M*icrosporum* and genera of *Trichophyton* which have been associated with causing superficial mycoses. These dermatophytes yield keratinases and these keratinases by degrading the keratin result in an invasion of the superficial tissues of the skin by these dermatophytes. These fungi generally infect the nonliving layers of skin which are usually cornified and are cutaneous infections.[3] Nevertheless, in conditions which are chronic, there may be involvement and invasion of deeper tissues, especially when there is

infection occurring concurrently with other organisms. As a whole, in simple words, dermatophytes usually lack the capacity for the invasion of tissues which are deeper or organs in the human host.[4]

Because of their typical ring-like appearance, infections caused by dermatophytes are commonly known as ringworm infections. This term is used inaccurately since it is not caused by a worm but because of the rash which is circular with a ring-like an appearance. They are also called as *Tinea* infections and they are termed in accordance with the position of the infection on the human body like the term *T. capitis* referring to infections in the region of the head. As these infections are frequently mixed up with other disorders of the skin, there is a need for making an early diagnosis in the laboratory for managing these conditions in the best way possible.[5]

Dermatophytes, on the basis of clinical, morphologic and microscopic characteristics are grouped in three anamorphic genera, *Trichophyton*, *Microsporum* and *Epidermophyton*.[6] The diagnosis of the species causing dermatophytosis is very important because of a single species having the ability to present with several clinical patterns and several species presenting with a single clinical pattern. So, there is a need for identifying the fungal species by doing a culture which also helps in identifying the infection source, so that the appropriate measures for prevention can be taken.

Hence, this study was carried out with an objective to measure the prevalence of different clinical patterns of dermatophytosis and to correlate our clinical diagnosis with KOH positivity and positivity by fungal culture keeping in account the ever-changing profile of these fungal infections in India, the Indian climate, its vast area and diversity, the change in the structure of population of India, scarce availability of data on the epidemiology and the aetiological factors mentioned above.

METHODS

The current study was a prospective observational study conducted in the department of dermatology and microbiology in a tertiary care hospital. The study population included patients presenting to the dermatology outpatient department, who are clinically diagnosed to have dermatophytosis between June 2016 to June 2017 were included in the study. Patients who had used topical or systemic antifungal preparation in the preceding 4 weeks were excluded from the study. Ethical clearance was obtained from IHEC. Written and informed consent was sought from the patients and their attenders

Collection and transport of specimens

Specimens were obtained under aseptic condition to minimize contamination. Skin scrapping, hair and nail clipping from the patients who are clinically diagnosed dermatophytosis were collected. Sufficient amount of specimen was collected for direct microscopic examination and culture. Prior to the collection of the specimen the sites were cleaned well with 70% alcohol while sterile distilled water was used for painful areas. Depending on the morphology and sites involved by dermatophytes specimen were collected using sterile nail clipping, scissors, epilation forceps, sterile scalpel blades and curettes. Black photographic paper was used for collecting and better visualization of skin scrapings. Collected specimens were treated with KOH, 10%, 20% for skin and hair respectively and for nail 40% was used. All preparations were examined under low power and confirmed under high power. The samples were inoculated into Sabourauds dextrose agar with (0.5%) cycloheximide and (0.05%) chloramphenicol were incorporated to avoid contamination with saprophytic fungi and bacteria. The inoculated agar slants were incubated in room temperature at 25ºC and 37ºC in incubator and observed daily for growth. If no growth was noticed by four weeks culture was considered negative for the growth of fungi. Growth on SDA were identified to genes and species level by LPCB mount.

Statistical methods

The demographic variables like age, gender of the affected person, clinical diagnosis, laboratory parameters like findings of KOH preparation and growth in culture were considered as relevant parameters. Odds ratio along with 95% CI are presented. Chi square test was used to test statistical significance. P value <0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis.

RESULTS

A total of 200 people presenting with dermatophyte infection were included in the study. The age of the subjects was ranged between 7 to 65 years, with a mean age of 33.65±11.61. Males constituted 72% of the study population and females constituted remaining 28% of the study population. Majority (52.50%) of the subjects were between the age group of 16 to 30 years. The percentage of subjects who were aged between 31 to 45 years was 31.50% (Table 1). The most common clinical presented was *T. corporis* (47.50%), followed by *T. unguium* (28%) and *T. cruris* (19.50%). Tinea involving other parts of the face, head, feet, and hands contributed to the remaining minor proportion of study population (Table 2).

KOH positivity was seen in 86 (43%) out of 200 cases in the study population. Among the study population, 55 (27.50%) were positive by culture and remaining 14

(72.50%) were negative culture (Table 3). Among the study population, 55 (27.5%) were both culture and KOH positive, 31 (15.5%) were KOH was positive but culture was negative. Both KOH and culture was negative was seen in 114 (57%) patients (Table 4).

The most common organism isolated in culture *was T. mentagrophyte* (10%), followed by *T. rubrum* (9.5%) and *T. tonsurans* (5.5%). The other minor proportion of culture isolated fungi were *Trichophyton Schoenleinii* and *Trichophyton verrucosum* in 1% each and *Microsporum gypseum* in 0.5% of the subjects. Table 5-7 states the association between the KOH and culture test with the organism.

Table 1: Age group of study population (n=200).

Age groups (in years)	Frequency	Percentage
<15	1	0.50
16-30	105	52.50
31-45	63	31.50
46-60	26	13.00
>61	5	2.50

Table 2: Descriptive analysis of diagnosis in study population (n=200).

Diagnosis	Frequency	Percent
T. corporis	95	47.50
T. unguium	56	28.00
T. cruris	39	19.50
T. faciei	4	2.00
T. capitis	3	1.50
T. pedis	2	1.00
T. manuum	1	0.50

Table 3: Proportion of KOH positivity in study population (n=200).

Parameters	Frequency	Percentage
KOH mount		
Positive	86	43.00
Negative	114	57.00
Culture category		
Positive	55	27.50
Negative	145	72.50

Table 4: Comparison of KOH and culture in study population (n=200).

KOH	Culture		
	Positive	**Negative**	**Total**
Positive	55	31	86
Negative	0	114	114
Total	55	145	200

Table 5: Descriptive analysis of type of fungus isolated in study population (n=200).

Cultures	Frequency	Percent (%)
No growth	145	72.50
T. mentagrophyte	20	10.00
T. rubrum	19	9.50
T. tonsurans	11	5.50
T. schoenleinii	2	1.00
T. verrucosum	2	1.00
M. gypseum	1	0.50

Table 6: Association of KOH mount with diagnosis of study population (n=200).

Diagnosis	KOH mount	
	Positive (%)	Negative (%)
T. corporis (n=95)	58 (61.05)	37 (38.94)
T. unguium (n=56)	10 (17.85)	46 (82.14)
T. cruris (n=39)	15 (38.46)	24 (61.53)
T. faciei (n=4)	3 (75)	1 (25)
T. capitis (n=3)	0 (0)	3 (100)
T. pedis (n=2)	0 (0)	2 (100)
T. manuum (n=1)	0 (0)	1 (100)

*No statistical test was applied considering 0 subjects in one of the cells.

Table 7: Association of culture category with diagnosis of study population (N=200).

Diagnosis	Culture category	
	Positive (%)	Negative (%)
T. corporis (n=95)	39 (41.05)	56 (58.94)
T. unguium (n=56)	4 (7.142)	52 (92.85)
T. cruris (n=39)	10 (25.64)	29 (74.35)
T. faciei (n=4)	2 (50)	2 (50)
T. capitis (n=3)	0 (0)	3 (100)
T. pedis (n=2)	0 (0)	2 (100)
T. manuum (n=1)	0 (0)	1 (100)

DISCUSSION

The most common fungal agents which have been linked around the globe with superficial infections of the skin are dermatophytes.[4] Besides being one of the common public health problems worldwide, deramatophytosis is commonly seen in countries of the tropical region such as India. It could reach epidemic levels in regions with high humidity levels, overcrowding and poor sanitary conditions.[7] In India, where the climate is so hot with high humidity, this fungal infection of the skin is very common.[8] There have been several numbers of studies done in India from all around the country on the distribution of dermatophytosis. With the increasing use of corticosteroids for managing these infections, there is a change in the profile of these infections over the years. Verma and Madhu also stressed the need for studies with regards to various factors related to dermatophytosis because of the changing mycological profile of these infections.[9]

In our study, the subjects had a mean age of 33.65±11.61 years ranging from about seven to sixty five years. In our study, most (52.50%) of the subjects were aged between sixteen to thirty years. Men constituted about seventy two percentage (72%) of the study population while women contributed to twenty eight percentage (28%) of the study population. Similar to our study, Prasad et al in their study observed that the maximum prevalence of *Tinea* cases occurred in the age group of twenty one to thirty years.[10] And also similar results were reported by Grover et al.[11] They reported that a higher prevalence of 39.6% was observed in their study in the same age group. Singh et al in their study in 2003 also observed that infection with superficial dermatophytes was highest in the age group of sixteen to thirty years.[12] Yehia et al in their study in 2010 observed that the mean age of the subjects was 28.5 years in Kuwait which was marginally lesser than our study with 33.65 years as the mean.[13] Grover et al in their study also reported the proportion of males to be higher than females in their study population with 80.9% of subjects to be males with only 19.1% to be females.[11] Singh et al also reported a similar ratio of 1.57:1 in their study population in western India.[12]

T. corporis was the most frequent in our study and the trunk, extremities and face were the sites most commonly involved. It was seen in about 47.50% of the subjects, succeeded by *T. unguium* in 28% of subjects and *T. cruris* in 19.50% of the study population. The remaining minor proportion was constituted by *Tinea* involving other parts like face, head, feet and hands. Prasad Petal in 1987 in their study reported that infections around the groin (*T. cruris*) was most frequently involved in males, but in females, the waist was the most common area involved.[10] In contrast to our findings, Grover et al reported *T. pedis* (29.2%) to be the most frequent which was followed by *T. cruris* (26.2%).[11] In the study done by Singh S et al the most frequent infection was *T. corporis*, succeeded by *T. cruris*.[12] Asticcioli et al also reported the most common infection as *T. corporis* and similar findings were also reported by Das et al in their study with *T. corporis* contributing to 21.4% of the infections diagnosed in the laboratory.[14,15] In contrast to our study, Maraki et al reported the most frequent infections was *T. unguium* followed by *T. pedis*.[16] Onychomycosis was reported as

the most frequent infection caused by fungi by Drakensjo et al and Yehia et al in their studies, contrary to our study findings.[13,17]

In our study, the proportion of KOH positive infections was 43% while the culture positivity was only 27.50%, out of the study population. Prasad Petal in their study, reported that the proportion of KOH positive infections was 52% while the proportion of culture positive infections was 42% in about hundred clinically diagnosed Tinea infections.[10] In contrast to our study, Grover et al in their study reported KOH positivity rate of 53.3% while culture positivity was only 79.1%.[11] Similar to our study, Singh S et al also reported that the proportion of KOH positivity was higher than the culture positivity among 157 subjects.[12] Yehia MA et al also similarly reported a higher rate of positivity with KOH compared to culture positivity.[13]

In our current study among the study population, 55 subjects that are around 27.5% of our study population had both culture and KOH positive. 15.5% of subjects had KOH positivity with negative culture but none of the subjects had negative KOH result when the culture was negative in the study. Neither KOH nor culture was positive in 57% of the subjects. Das S et al reported that 47% of clinically suspected subjects were positive for fungal infection by microscopy and/or culture.[15] They reported that 86.5% were positive by both KOH and culture while only 2.75% were KOH negative and culture positive and both were negative in about 53% of subjects.

The most common organism isolated in culture was *T. mentagrophyte* (10%), followed by *T. Rubrum* (9.5%) and *T. tonsurans* (5.5%). The other minor proportion of culture isolated fungi were *T. schoenleinii* and *T. verrucosum* in 1% each and *M. gypsum* in 0.5% of the subjects. Similar to our study, in the study done by Prasad Petal it was *T. mentagrophytes* seen in 46.90% of the study subjects followed by *T. rubrum* saw in 31.9% of the study population.[10] Grover et al reported *T. tonsurans* as the commonest in about 20.5%, succeeded by *T. rubrum* in 8.7% of the study population.[11] Similar to our study results, Singh et al also isolated *T. rubrum* in 73.27% of the study subjects followed by *T. mentagrophytes* and also Das et al observed similar results on isolation with *T. rubrum* being the most frequent.[12,15] Maraki et al and Drakensjo et al also reported *T. rubrum* as the most commonly observed dermatophyte while Yehia et al 13 observed that *T. mentagrophytes* was the commonest dermatophyte isolated in their study.[16,17]

Garg et al in their study have observed that traditional methods like KOH microscopy and culture have underdiagnosed the infections caused by fungi on a large scale and there is a need for nested PCR to be deliberated a gold standard for confirming the diagnosis in the modern world.[18]

The generalizability of the study findings may be limited as the results form a single tertiary care teaching hospital. The tendency of the patients to report very late and only in treatment-refractory cases to this level of care may not reflect the true profile of these infections in the community. Even though our current study is done in a hospital-based population, we focused principally on the commonly prevalent infections of dermatophytes and the agreement between diagnosis by culture and KOH microscopy. There is a need for epidemiological studies of longer duration involving regions all over the country in multiple centers, with the changing profile of dermatophytosis because of increasing use of steroids enhancing on the methods for easy, accurate and rapid detection.

CONCLUSION

The commonest clinical pattern of dermatophytosis was *T. corporis*, followed by *T. unguium* and *T. cruris*. In culture commonest organism isolated was *T. mentagrophyte*, followed by *T. rubrum* and *T. tonsurans*. With more male predominance KOH positivity was seen in 86 patients in which culture was positive in 55 patients and other 31patients culture was negative but KOH was positive. None of the patients had KOH negative status when culture was negative. Neither KOH nor culture was positive in 114 patients.

Commonest clinical pattern was *T. corporis* and culture organism isolated was *T. mentagrophyte*. KOH and culture help in diagnosing and starting treatment but it's not always mandatory, it can be clinically diagnosed and treated.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

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Cite this article as: Munusamy R, Subramanian P. A clinical and mycological study of dermatophytosis in a tertiary care hospital. Int J Res Dermatol 2021;7:429-34.