

Prevalence of Dermatophytosis in South Indian Populations: A Research Hospital Based Study

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Authors' contributions

This work was carried out in collaboration among all authors. All the authors have accepted the responsibility for the entire content of the submitted manuscript and approved the final manuscript.

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ABSTRACT

Aim: Dermatophytosis is a superficial fungal infection distributed worldwide, more prevalent in the tropical countries like India. Dermatophytosis is diagnosed based on the history, physical examination, and laboratory diagnosis by Microscopic examination of Potassium Hydroxide (KOH) Mount followed by fungal culture. KOH mount is a rapid, simple, time saving and cost effective diagnostic method. The present study was conducted to know the prevalence and common clinical presentations of Dermatophytosis in Hyderabad, South India.

Materials and Methods: The study was carried out in Clinical Microbiology section of the Laboratory of the Skin Research Institute in Hyderabad, South India, for a period of 1 year from August 2020 to September 2021. A total of 236 skin scraping samples from clinically suspected cases of dermatophytosis were collected. A detailed clinical history of the patients was recorded and skin scraping samples was subjected to KOH test.

Results: Of all the 236 patients, 186 patients (78.81%) were positive of fungal elements. Males (58.06 %) were more commonly affected than females (41.94%). *Tinea corporis* was the most

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common clinical type (50%) followed by *Tinea Cruris* (22.58%). The microscopic finding revealed 49.46% of samples showing long, septate hyphae, 39.78% of samples showing Spaghetti and meatball appearance and 10.75% of samples showing pseudohyphae with budding yeast cells forms.

Conclusions: The prevalence of Dermatophytosis is high in the study population. In experienced hands, a potassium hydroxide mount is one of the most useful procedures in medical mycology and can be used as screening test and routine investigation in the diagnosis of dermatophytosis so that definite treatment can be commenced without delay.

Keywords: *Dermatophytosis; KOH mount; potassium hydroxide; tinea.*

1. INTRODUCTION

Dermatophytosis is an important superficial fungal infection of keratinized tissues of skin infection caused by closely related keratinophilic mycelial fungi (Dermatophytes) belonging to three asexual genera *Microsporum*, *Trichophyton*, and *Epidermophyton* [1-2]. Dermatophytes infections are one of the earliest known fungal infections of mankind and are prevalent throughout the world. Although Dermatophytosis does not cause mortality, it causes much discomfort and distress to the patient, creating a major public health problem, especially in developing tropical countries like India [3].

The prevalence and frequency of Dermatophytosis and their etiology vary according to the geographic region, epidemiological factors like environmental temperature and humidity, the socioeconomic level of the population, personal hygiene, and the climatic variations. The hot and humid climate in tropical and subtropical countries like India makes Dermatophytosis a very common fungal skin infection in India [3]. The severity of the infection depends on strain or species of fungus, the sensitivity of the host and the site of infection [4].

The Dermatophytosis can easily be diagnosed based on the history, physical examination, and laboratory diagnosis. The laboratory diagnosis of Dermatophytosis routinely involves Potassium Hydroxide (KOH) Mount and direct microscopic examination of clinical specimen followed by in vitro fungal culture techniques [5]. With the advent of molecular technology, the techniques like polymerase chain reaction which is a highly sensitive and specific test can be used for confirmation of diagnosis of fungal Infections [5]. Fungal culture although is the gold standard diagnostic test, it is a slow technique taking minimum 2-3 weeks and require sophisticated

lab and trained personnel hence not feasible for routine investigation in developing country like India [6,7].

Microscopic identification of fungal elements by KOH mount is a rapid diagnostic method and can be used as screening test and routine investigation in the diagnosis of Dermatophytosis since it is simple, time saving and cost effective when compared with fungal culture [8]. The present study was conducted to know the prevalence and common clinical presentations of Dermatophytosis in Hyderabad, South India.

2. MATERIALS AND METHODS

The study was conducted over a period of 1 year from August 2020 to September 2021 and included 236 clinically suspected cases of Dermatophytosis attending the Out Patient Services of National Research Institute of Unani Medicine For Skin Disorders, Hyderabad. Patient history and demographic factors were recorded. Samples were collected from site of suspected infection using standard methods [9,10].

The areas affected were cleaned with a 70% ethanol solution. The skin samples were collected by scrapping of lesion with sterile blade and transferred to sterile folded papers, labeled and then taken to the Clinical Microbiology section of the Laboratory of the National Research Institute of Unani Medicine for Skin Disorders, Hyderabad. The skin scrapping was transferred to microscope slide labeled with patients' identity, followed by applying one or two drop of freshly prepared 10% KOH solution and was covered with the cover slip [10].

Each treated slide was carefully examined under low (X10) and high (X40) power for the presence of hyphae spores, yeasts, and pseudohyphael forms. The test was considered positive if hyphae and/or spores were detected under the microscope [10].

3. RESULTS AND DISCUSSIONS

3.1 Results

This study included 236 cases of clinically diagnosed superficial dermatophytosis. Direct microscopy with KOH mount was positive in 186 patients (78.81%) (Table 1).

Table 1. Direct microscopy with KOH mount finding

KOH mount finding	Number of patients	Percentage
Positive	186	78.81 %
Negative	50	22.03 %

The patients' age ranged from 10 years to 62 years with average age 29.96 ±10.94. The commonest age group involved was 21-30 years (40.32%) followed by 31-40 years (23.11%). Majority of patient (108, 58.06%) were Males and 78 (41.94%) were Female (Table 2).

Table 2. Age and Sex distribution of patients

Parameter	Number of patients	Percentage
Age: 10-20	40	21.50%
21-30	75	40.32%
31-40	43	23.11%
41-50	17	9.13%
>50	11	5.91%
Sex		
Male	108	58.06%
Female	78	41.94%

Distribution of site of Infection: Frequency and percentage distributions of clinical manifestations in relation to sex. *Tinea Corporis*, *Tinea Mannum* and *Tinea Pedis* was observed more commonly in males compares to females, while *Tinea Cruris* and *Tinea Faciei* was common in females then in males (Table 3). *Tinea Corporis* was commonly observed in age group 21 -30 years while *Tinea Cruris* was observed commonly in age group 31-40 years (Table 4).

Table 3. Frequency and percentage distributions of clinical manifestations in relation to sex (n=186)

Clinical manifestation	SEX		Total (Percentage)
	Male (%)	Female (%)	
Tinea Corporis (Body)	60 (64.51%)	33 (35.48%)	93 (50%)
Tinea Cruris (groin)	19 (45.23%)	23 (54.76%)	42 (22.58%)
Tinea Pedis (foot)	08 (100%)	0	8 (4.3%)
Tinea Faciei (face)	3 (20%)	12 (80%)	15 (8.06%)
Tinea Mannum (hand)	19 (67.85%)	9 (32.14%)	28 (15.05%)
TOTAL	109 (58.6%)	77 (41.39%)	186 (100%)

Table 4. Frequency of clinical manifestation in different age groups (n= 186)

Site	10-20 (%)	21-30 (%)	31-40 (%)	41-50 (%)	>50 (%)	Total
Tinea Corporis (Body)	16 (17.20%)	40 (43.01%)	20 (21.5%)	10 (10.75%)	7 (7.52%)	93
Tinea Cruris (groin)	09 (21.42%)	10 (23.80%)	16 (38.09%)	05 (11.90%)	02 (4.76%)	42
Tinea Pedis (foot)	01 (12.5%)	04 (50%)	01 (12.5%)	02 (25%)	0 (0%)	08
Tinea Faciei (face)	05 (33.3.%)	06 (40%)	04 (26.66%)	0 (0%)	0 (0%)	15
Tinea Mannum (hand)	03 (10.71%)	11 (39.28%)	08 (28.57%)	04 (14.28%)	02 (7.14%)	28

Microscopic Findings of Potassium Hydroxide Mount: The distributions of clinical manifestations in relation to the direct microscopic potassium hydroxide examination of the scales or erosions from lesions showed Long

refractile branching septate hyphae in 48.92% of subjects, Spaghetti and meatball appearance in 39.78% of subjects and pseudohyphae with budding yeast cells forms in only 11.29% of subjects (Table 5).

Table 5. Microscopic findings of potassium hydroxide mount (n=186)

Clinical manifestation	Microscopic Findings		
	Long refractile, branching and septate hyphae	Spaghetti and meatball appearance	Pseudohyphae and budding yeast cells
Tinea corporis (Body)	56	37	0
Tinea cruris (groin)	16	14	12
Tinea pedis (foot)	1	2	5
Tinea faciei (face)	8	7	0
Tinea manuum (hand)	11	14	3
TOTAL (percentage)	92 (49.46%)	74 (39.78%)	20 (10.75%)

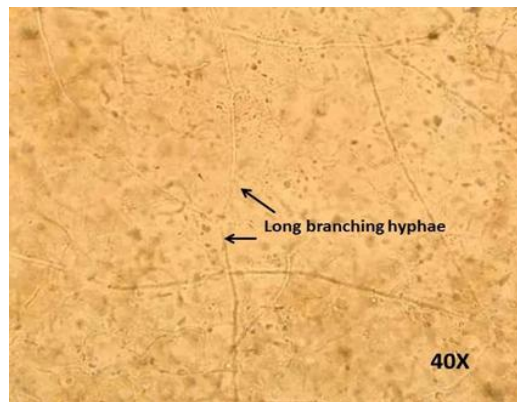


Fig. 1. Skin scraping and KOH mount showing long branching, refractile, septate fungal hyphae (KOH Mount 40X)

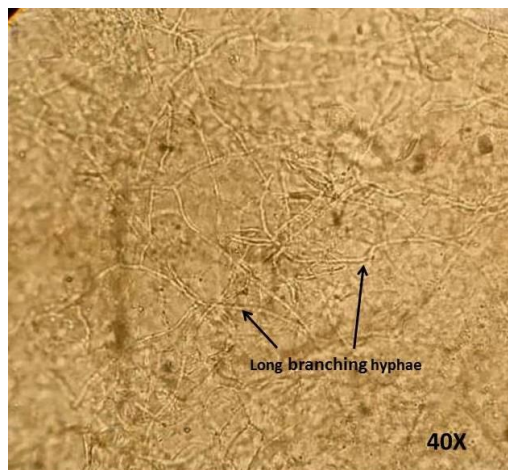


Fig. 2. Skin scraping and KOH mount showing long branching, refractile, septate fungal hyphae (KOH Mount 40X)

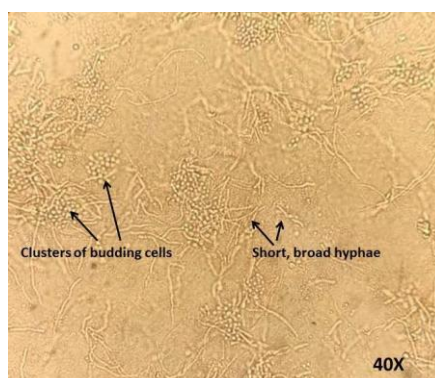


Fig. 3. Skin scraping and KOH mount showing short, broad hyphae and clusters of budding cells long branching, refractile and septate fungal hyphae having appearance of “spaghetti & meat balls. (KOH Mount 40X)

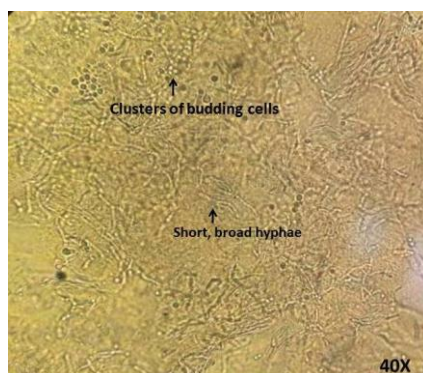


Fig. 4. Skin scraping and KOH mount showing short, broad hyphae and clusters of budding cells long branching, refractile and septate fungal hyphae having appearance of “spaghetti & meat balls. (KOH Mount 40X)

3.2 Discussion

Dermatophytosis is an important superficial fungal distributed worldwide, but it is more prevalent in the tropical and subtropical countries like India, where hot and humid climate plays an important role in promoting the growth of these organisms. Dermatophytosis is diagnosed based on the history, physical examination, and laboratory diagnosis by Microscopic examination of KOH Mount followed by fungal culture techniques [10]. The present study attempted to determine the prevalence of Dermatophyte infections in patients attending a Skin Research Institute in Hyderabad, South India over a period of one year with the help of KOH Mount.

In the present study, of all the 236 patients presenting with clinical features of skin infection, 186 patients (78.81%) were found to be positive of fungal elements in KOH Mount. Males (58.06%) were more commonly affected than females (41.94%). These observations were

comparable with other studies like Vara et al. [3], Noronha et al. [1], and Gupta et al. [7]. This may be due to the occupation of men and their nature of work leading to excessive sweating and the increase exposure with different people of the society. The lower incidence in females may be also due to the non-reporting of the female patients to the hospitals or due to the prevailing social stigma associated with this condition. The patient data was categorized on the basis of age groups of 10 years to 60 years and above in groups of 10 years gap. It was found that the maximum incidence (40.32%) was observed in the age group of 21 to 30 years. This finding was in accordance with study done by Gupta et al., where 47% patients was observed in the age group of 16 to 30 years [7], and also in study done by Noronha et al., where majority of the patients belonged to the age group of 21–30 years [1].

Tinea corporis was the most common clinical type with 93 (50%), followed by *Tinea Cruris* with

42 cases (22.58%) and *Tinea mannum* with 28 cases (15.05%) This finding is comparable with studies by Noronha et al. [1], Surendran et al. [11], Bindu et al. [12] and Singh et al. [13]. *Tinea Corporis* was more common in the age group of 21–30 years with 40 cases (43.01%). *Tinea Cruris* was more common in the age group of 31–40 years with 16 cases (38.09%). *Tinea Mannum* was more common in the age group of 21–30 years with 11 cases (39.28%). *Tinea Faciei* and *Tinea Pedis* were more common in the age groups of 21–30 years.

KOH mount microscopic examination of Dermatophytic infection showed long, refractile, smooth, branching, and septate hyphal filaments with/without spores. Dermatophytes were moulds belonging to the three genera of fungi imperfection- Microsporum, Trichophyton, and Epidermophyton [11]. KOH mount microscopic findings of Pityriasis versicolor caused by *Malassezia furfur* showed numerous short, broad hyphae and clusters of budding cells [14], Infection with Candidiasis demonstrate Pseudohyphae and budding yeast cells [15].

Fungal elements were demonstrated by direct microscopy in 186 (78.81%) cases out of 236 cases. The distributions of clinical manifestations in relation to the direct microscopic potassium hydroxide examination of the scales or erosions from lesions showed Long, refractile, branching, septate hyphae in 92 cases (49.46%); Spaghetti and meatball appearance in 74 cases (39.78%) and pseudohyphae with budding yeast cells forms in only 20 cases (10.75%).

The KOH positivity rate was 78.81%, which correlates with findings of other similar studies done by Komal et al (73.6%) [16], Begari et al (81.82%) [8], Jain et al (72.5%) [17] and Poluri et al (58.18%) [18]. The present study demonstrates that rapid diagnosis of superficial fungal infections can be done using KOH mount microscopic examination as this method is a reliable, inexpensive, outpatient procedure which yields quick results so that definite treatment can be commenced without any delay. Fungal culture although a good confirmatory test for identifying fungus, takes a minimum 3 weeks' time to obtain results, hence not very practical [15].

The KOH wet mount is a primary screening tool for the detection of fungal elements. The main disadvantages of the KOH wet mount is requirement of expertise for interpretation as KOH wet mount lacks a color contrast and

artifacts such as clothing fibers and mosaic fungus may interfere with the results and easily mistaken for fungal hyphae. KOH wet mount has low sensitivity when hyphae and fungal elements are sparse in the material collected hence a negative test does not rule out fungal infection.

4. CONCLUSION

Dermatophytosis is a common fungal infection in developing countries like India. In the present study, it is found to be more prevalent in male than in females, common in 2nd to 3rd decade of life and *Tenia Corporis* being the most common clinical presentation. The KOH positivity rate is 78.81%. It can be used as screening test in the diagnosis of Dermatophytosis so that definite treatment can be commenced without delay as fungal culture takes a long time to obtain results and not very practical. Nevertheless the KOH wet mount requires expertise for interpretation.

5. RECOMMENDATION

We recommend that a prospective study including fungal culture to be conducted to know the etiology of Dermatophytosis and also to compare the sensitivity and specificity of KOH with fungal culture.

CONSENT

"All authors declare that 'written informed consent was obtained from the patient (or other approved parties) for publication of this clinical data and accompanying images."

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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