

## Original Research Article

# Dermatophytosis: a clinical study and efficacy of KOH examination as compared to culture

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## ABSTRACT

**Background:** Dermatophytosis is very common condition. It is important to study their pattern and nature for proper diagnosis as well as management. The objective of the study was to study pattern of dermatophytosis and to study efficacy of KOH examination in comparison to culture.

**Methods:** A hospital based cross sectional study was carried out among 100 randomly selected patients with dermatophytosis for one year. Skin smears were examined with KOH. All such samples were also sent for culture examination. The results of KOH and culture were compared to see the efficacy of KOH.

**Results:** It was found that *T. corporis* was the most common clinical type of dermatophytosis in 48% of the cases. Most commonly affected age group was 21-30 years. Males were more commonly affected (55%) than females (45%). *T. corporis* was the most common infection in both the sexes followed by *T. cruris*, *T. barbae* and *T. manuum* are not seen among females while *T. pedis* was not seen among males. Maximum number of cases i.e. 72% was seen during summer season. The source of infection was not known in 81% of the cases. The sensitivity of the KOH was 95.5% and the specificity was 94.1%. The most common species responsible for dermatophytosis was *T. rubrum* in 38% of the cases.

**Conclusions:** The dermatophytosis was very commonly found in our settings. *T. corporis* was the most common clinical type. Majority of cases were seen during summer. KOH examination is useful for the diagnosis.

**Keywords:** Dermatophytosis, Infection, Clinical types, KOH examination

## INTRODUCTION

Dermatophytosis is very commonly seen among outpatients of dermatology department. Usually the keratinized tissue is affected. The hair, skin and nails consists of keratinized tissue. Dermatophytes are the fungi which are responsible for such type of infections. Dermatophytes include fungi like "*Trichophyton*, *Microsporium*, and *Epidermophyton*." They are filamentous in structure. They have very unique characteristics of degrading the keratin. They can also

invade the skin. Even they can invade the appendages of the skin. Thus they are responsible for dermatophytosis.<sup>1</sup>

Dermatophytosis is very important infection. This is because they affect most of the people. This kind of infection leads to a lot of discomfort. Body reacts to these infections and the type of reaction can be mild, moderate or severe. This is dependent on a number of factors. How the body reacts to the fungal metabolic products varies from person to person. It also depends upon the disease producing power of the fungi. The reaction of the body towards the dermatophytosis also depends upon the body

part affected. It also depends upon the various other local factors. About more than half of the cases seen in the dermatology consists of cases of dermatophytosis. The risk factors of dermatophytosis which leads to the increased prevalence are improper hygiene as it can lead to repeated infections, overcrowding favors spread of these infections due to high chances of close contact, people with poor living standards are also exposed to the risk of these infections as they are generally having poor living standards and they tend to live in overcrowded houses. Among environmental risk factors for these infections, humidity is supposed to be favoring the transmission of these infections. All these factors favor disease transmission.<sup>2</sup>

Contrary to the popular belief, man is a host commonly for the infections of origin of the fungi. These infections are attracting a great deal of attention not only in the developed countries but also in the developing countries. This may be due to increased health awareness among the people. Particularly in countries like India, where there is hot and humid environment; dermatophytosis is very common, mostly affecting the superficial parts of the skin. These fungi have the affinity towards the keratin tissues and therefore these infections are very common. Their incubation period is very long. They take long time to grow. Now days due to increased use of topical medications, the classical clinical picture of dermatophytosis is difficult to see commonly and hence there are chances of improper diagnosis which can lead to improper treatment of these conditions.<sup>3</sup>

KOH is commonly used for diagnosis of dermatophytosis. It is a very useful technique and cost effective compared to culture which takes a long time and costly.

Present study was carried out to study pattern of dermatophytosis and to study efficacy of KOH examination in comparison to culture.

## **METHODS**

### ***Study design***

Hospital based cross sectional study.

### ***Study period***

May 2017 to April 2018.

### ***Study place***

Department of Department of Dermatology, Venereology and Leprosy, Malla Reddy Institute of Medical Sciences, Suraram, Hyderabad, Telangana, India.

### ***Sample size***

During study period, a total of 100 randomly selected patients belonging to all age groups and both sexes and

diagnosed with dermatophytosis were included in the present study.

### ***Ethical considerations***

The proposal of the study was submitted to the Institution Human Ethics Committee which approved the proposal for the present study. After their approval, the patients were enrolled in the present study after taking their informed consent. All patients were treated properly as per the standard guidelines and protocol

### ***Inclusion criteria***

Inclusion criteria were all age groups and both sexes; willing to participate in the present study; not taken any anti-fungal treatment (topical as well as systemic) in the last four weeks.

### ***Exclusion criteria***

Exclusion criteria were patients with subcutaneous and deep fungal infections.

### ***Methodology***

Each patient demographic details like age, sex, SES, occupation, habits, duration of disease, h/o recurrence and associated diseases, h/o similar complaints in the family members and contact with animals or soil etc. were recorded in the pre designed, pre tested, semi structured study questionnaire prepared for the present study. Thorough clinical examination was carried out for all enrolled patients in the present study.

Patients were classified as per types of the fungal infections. Routine investigations like complete blood picture and complete urine examination were carried out. In cases of *T. capitis* infections, wood lamp examination was carried out.

Direct microscopy (in 10% KOH) and fungal culture were done for all patients. Additional investigations like random blood sugar, HIV status, VDRL etc. were done if required.

Patients were treated with standard guidelines and protocol. They were also provided counselling on proper hygiene, avoiding overcrowding, regular check up and taking complete course of treatment etc.

### ***Statistical analysis***

The data was entered in the Microsoft Excel worksheet and analyzed using proportions.

## **RESULTS**

It was found that *T. corporis* was the most common clinical type of all dermatophytosis in 48% of the cases

followed by *T. cruris* in 26% of the cases. Most commonly affected age group was 21-30 years in 40% of

the cases followed by 31-40 years where 26% were affected (Table 1).

**Table 1: Age wise distribution of various types of dermatophytosis.**

Clinical types	Age groups (year)					Total
	1-20	21-30	31-40	41-50	>50	
Mixed	0	1	1	0	0	2
<i>T. barbae</i>	0	1	1	0	0	2
<i>T. capitis</i>	4	0	0	0	0	4
<i>T. corporis</i>	3	11	12	11	6	48
<i>T. cruris</i>	2	11	7	3	3	26
<i>T. faciei</i>	0	5	2	1	0	8
<i>T. manuum</i>	0	2	1	0	0	3
<i>T. pedis</i>	0	1	1	0	0	2
<i>T. unguium</i>	0	3	1	1	0	5
Total	9	40	26	16	9	100

**Table 2: Sex wise distribution of various types of dermatophytosis.**

Clinical types	Female	Male	Total
Mixed	1	1	2
<i>T. barbae</i>	0	2	2
<i>T. capitis</i>	1	3	4
<i>T. corporis</i>	20	28	48
<i>T. cruris</i>	10	16	26
<i>T. faciei</i>	7	1	8
<i>T. manuum</i>	0	3	3
<i>T. pedis</i>	2	0	2
<i>T. unguium</i>	4	1	5
Total	45	55	100

**Table 3: Seasonal incidence of dermatophytosis.**

Season	Month	Number	%
Summer	February to May	72	72
Rainy	June to September	20	20
Winter	October to January	8	8
Total		100	100

**Table 4: Distribution of study subjects as per source of infection.**

Source of infection	Number	%
Friends	14	14
Family	5	5
Unknown	81	81
Total	100	100

Males were more commonly affected (55%) than females (45%). The male to female ratio was 1.2:1. *T. corporis* was the most common clinical type in both the sexes followed by *T. cruris*, *T. barbae* and *T. manuum* are not seen among females while *T. pedis* was not seen among males (Table 2).

A huge number of cases i.e. 72% were seen during summer season followed by rainy season where we found

20% of the cases. Only 8% of the cases were seen during winter. This finding supports the fact that hot and humid climate is a risk factor for dermatophytosis (Table 3).

The most common source of infection was friends in 14% of the cases followed by family in 5% of the cases. The source of infection was not known in 81% of the cases (Table 4).

**Table 5: Efficacy of KOH examination as compared to culture.**

	Culture result		Total (%)
	Positive (%)	Negative (%)	
<b>KOH result</b>			
Positive	63	32	95
Negative	3	2	5
Total	66	34	100
<b>KOH efficacy</b>			
Sensitivity	95.5		
Specificity	94.1		
PPV	66.3		
NPV	40		

**Table 6: Incidence of species in different clinical types.**

Clinical types	Culture negative	Species				Total
		<i>M. audouinii</i>	<i>T. mentagrophytes</i>	<i>T. rubrum</i>	<i>T. violaceum</i>	
<b>Mixed</b>	0	0	0	2	0	2
<b>T. barbae</b>	1	0	0	0	1	2
<b>T. capitis</b>	1	1	0	0	2	4
<b>T. corporis</b>	19	0	12	17	0	48
<b>T. cruris</b>	7	0	9	10	0	26
<b>T. faciei</b>	2	0	2	4	0	8
<b>T. manuum</b>	1	0	0	2	0	3
<b>T. pedis</b>	1	0	1	0	0	2
<b>T. unguium</b>	2	0	0	3	0	5
<b>Total</b>	34	1	24	38	3	100

The sensitivity of the KOH was 95.5% and the specificity was 94.1%. The positive predictive value was 66.3% and the negative predictive value was 40%. Hence KOH examination was found to be useful (Table 5).

The most common species of fungi responsible for the dermatophytosis was *T. rubrum* in 38% of the cases followed by *T. mentagrophytes* in 24% of the cases. 34% of the samples were culture negative (Table 6).

## DISCUSSION

It was found that *T. corporis* was the most common clinical type of all dermatophytosis in 48% of the cases followed by *T. cruris* in 26% of the cases. Most commonly affected age group was 21-30 years in 40% of the cases followed by 31-40 years where 26% were affected.

Males were more commonly affected (55%) than females (45%). The male to female ratio was 1.2:1. *T. corporis* was the most common infection in both the sexes followed by *T. cruris*. *T. barbae* and *T. manuum* are not seen among females while *T. pedis* was not seen among males.

A huge number of cases i.e. 72% were seen during summer season followed by rainy season where we found

20% of the cases. Only 8% of the cases were seen during winter. This finding supports the fact that hot and humid climate is a risk factor for dermatophytosis.

The most common source of infection was friends in 14% of the cases followed by family in 5% of the cases. The source of infection was not known in 81% of the cases.

The sensitivity of the KOH was 95.5% and the specificity was 94.1%. The positive predictive value was 66.3% and the negative predictive value was 40%. Hence KOH examination was found to be useful.

The most common species of fungi responsible for dermatophytosis was *T. rubrum* in 38% of the cases followed by *T. mentagrophytes* in 24% of the cases. 34% of the samples were culture negative.

Poluri et al carried out a study to find out the causes of dermatophytosis in South India.<sup>2</sup> They studied 110 samples out of which nine were hair samples. They also did KOH examination and culture examination. They found that 58.18% were positive with KOH compared to 56.36% positivity by culture examination. But we found that KOH positive were 95% compared to 66% positivity by culture examination. The author reported that majority were in the age group of 21-30 years which is similar to the finding of the present study. They also found that

females were less affected than males which are similar to the finding of the present study. The authors observed that *T. rubrum* was the common isolate seen in 58.06% of the cases. *T. corporis* was the common clinical presentation seen in 40% of the cases. We also observed similar findings.

Singh et al concluded that when 40% dimethyl sulphoxide (DMSO) was added to the KOH mount it gave very good results which were comparable to the culture results.<sup>3</sup> We also found that the sensitivity of the KOH was 95.5% and the specificity was 94.1%.

Monwar et al carried out a study to find out the “etiologiical agent of dermatophytosis” among 230 cases of dermatophytosis who were suspected on clinical examination.<sup>4</sup> They reported that 27.4% were positive on KOH examination while 23% were positive by culture examination. But we found that KOH positive cases were 95% and 66% positivity by culture examination. They reported that 83% were *T. rubrum* isolates which is higher than the findings of the present study where we found that it was 38%.

Vyas et al studied clinical pattern and etiology in North India.<sup>5</sup> They collected skin scrapings, and samples of nail and hair in 160 cases of clinically suspected. The culture positive rate was 37.5%. But we found that 66% were culture positive in the present study. They reported that *T. capititis* was the most common infection in 50% of the cases. But we found that *T. corporis* was most common clinical type.

Paudel et al conducted a study on 110 samples from cases that were suspected of having dermatophytosis clinically in Nepal.<sup>6</sup> They reported that the most commonly affected age group was 21-30 years in 29.1% of the cases and the male to female ratio was 1.39:1. These findings are similar to the findings of the present study. KOH positivity was 52.72% and 43.63% were positive by culture. But we found that 95% were KOH positive and 66% were culture positive. They found that *T. corporis* was the most common clinical type in 29.1% of the cases followed by *T. cruris*. These findings are also similar to the findings of the present study.

Bindu et al studied 150 patients and found that *T. corporis* was the most common clinical type and the next most common type was *T. cruris*.<sup>7</sup> These findings are similar to the findings of the present study. 45.3% of the cases were found positive by culture method and 64% by KOH in their study. But we found that 95% were KOH positive and 66% were culture positive.

Monwar et al in their study of 230 cases found that 27.39% were positive by KOH while 23.04% were positive by culture method.<sup>8</sup> But we found that 95% were KOH positive and 66% were culture positive. They noted that *T. unguium* was the most common clinical type followed by *T. corporis*. But we found that *T. corporis*

was most common clinical type. They reported that the infection was common in 21-30 years of age and males were more affected than females. These findings are similar to the findings of the present study.

Venkatesan et al studied 90 cases and found that 78.9% were culture positive.<sup>9</sup> We found that 66% were culture positive. *T. rubrum* was the most common in 73.3% of the cases followed by *T. mentagrophytes* in 19.7% of the cases. But we found that *T. corporis* was most common clinical type.

Valdigem et al observed that of the total cases studied, 23.6% were dermatophytic and 7% were not dermatophytic.<sup>10</sup> They found that there was no statistically significant difference between the occurrences of infection among sexes. We also found that the male to female ration was not much significant. They concluded that the most common causative agent was *T. rubrum*.

## CONCLUSION

The dermatophytosis was very commonly found in our settings. *T. corporis* was the most common clinical type. Majority of cases were seen during summer. KOH examination is useful tool for the diagnosis of the dermatophytosis.

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