

Original Research

A study on clinical presentation of dermatophytosis among diabetic patients

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ABSTRACT:

Background: Trichophyton, Microsporum and Epidermophyton are collectively known as dermatophytes. The increased incidence of dermatophyte infection is influenced by an increased number of diabetic patients. The diverse clinical presentation of dermatophytes is related to the species and strains of fungus, involved sites, size of inoculum and immune status of hosts. We planned this study to isolate and identify the causative fungus of dermatophytosis among diabetic patients and to study about the antifungal susceptibility pattern of isolated dermatophytes by microbroth dilution method. **Methods:** 60 diabetic patients with clinically diagnosed dermatophytosis were included in this study. Skin, hair and nails were collected aseptically from the patients depending on the clinical symptoms. Direct microscopic examination was done for all the samples with KOH. Irrespective of direct microscopic observation, all collected samples were inoculated on Sabouraud Dextrose agar with chloramphenicol / gentamicin and cycloheximide. **Results:** Dermatophyte growth was obtained in 48 (80%) specimens. The most commonly isolated dermatophyte was Trichophyton rubrum. Antifungal susceptibility testing was done for the 48 isolates and 41 were sensitive to terbinafine. **Conclusion:** Early isolation and antifungal sensitivity results will help to initiate appropriate treatment in diabetic patients with dermatophytosis.

Keywords: dermatophytes, dermatophytosis, Trichophyton rubrum, diabetes mellitus.

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INTRODUCTION

Dermatophytosis is the most common type of cutaneous fungal infection. These are caused by a group of closely related keratinophilic fungi, which are capable of invading keratinized tissues of skin and its appendages like hair and nail. They belong to three mycelial fungal genera i.e. *Trichophyton*, *Microsporum* and *Epidermophyton* and are collectively known as dermatophytes. They are generally classified as anthropophilic, zoophilic and geophilic on the basis of their ecology. The fungal species exclusively affecting humans are known as anthropophilic. Those inhabiting domestic and wild animals as well as birds are called zoophilic. A third

group, frequently isolated from soil is known as geophilic.

The prevalence of superficial mycotic infection worldwide is 20 – 25% of which dermatophytes are the most common agents. In tropical countries like India, hot and humid climate makes dermatophytosis as a very common superficial fungal infection and it remains a significant public health problem. Increased incidence of dermatophyte infection is influenced by an increased number of diabetic patients. Diabetes mellitus is a world-wide problem of increasing importance. Van Houtum⁸ has estimated at a total of 380 million diabetic patients by 2025. The World Health Organization estimates that the diabetic

population in India by 2030 is likely to rise to 79.4 million (Wilds Roglic et al.,2004)⁹.

The diverse clinical presentation of dermatophytes is related to the species and strains of fungus, involved sites, size of inoculum and immune status of hosts. The immunological status of diabetic individuals determines the clinical course of the disease. Depression of cellular immunity can lead to atypical generalized invasive dermatophyte infection. Skin and nail infections are the most common cutaneous fungal infections in diabetic patients. Diabetic patients are more susceptible to severe or refractory dermatophytosis.

Laboratory diagnosis of dermatophytes is needed to support the clinical diagnosis. Dermatophytes can grow on conventional media like Sabouraud dextrose agar with antibiotics and cycloheximide and on Potato dextrose agar. Dermatophytes have evolved drug resistance for single as well as multiple drugs simultaneously. Due to increasing trend of resistance among dermatophytes, treatment should be initiated early based on antifungal sensitivity testing.

AIMS AND OBJECTIVES

1. To isolate and identify the causative fungus of dermatophytosis among diabetic patients.
2. To study about the antifungal susceptibility pattern of isolated dermatophytes by microbroth dilution method.

MATERIALS AND METHODS

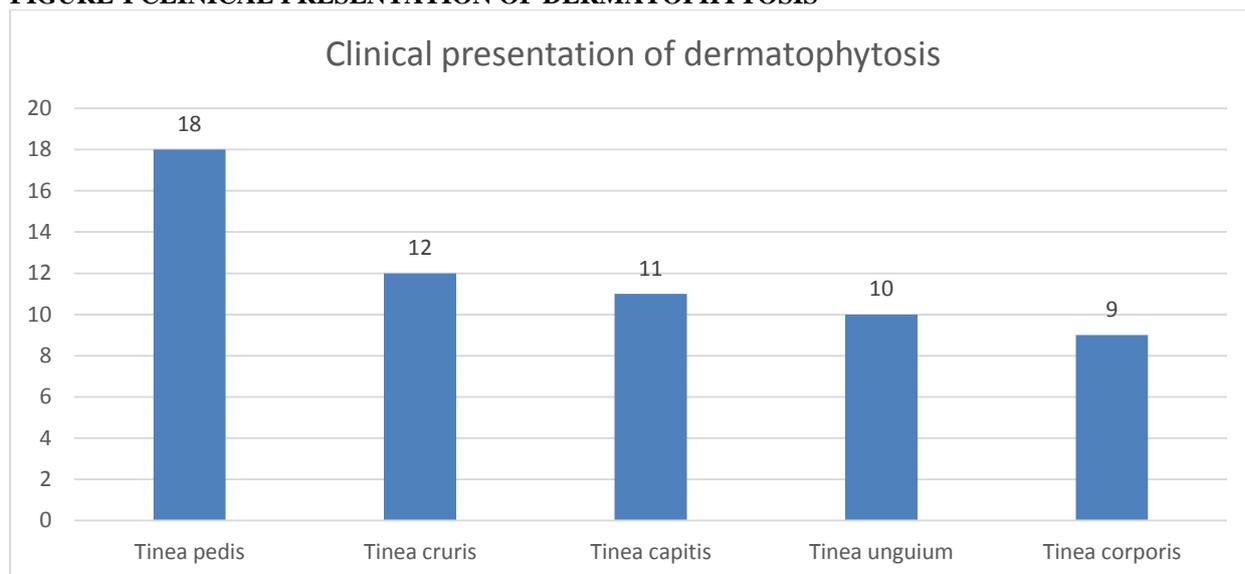
The study was an observational study conducted at Madurai medical college, Government Rajaji Hospital, Madurai. Ethical committee approval was obtained. 60 diabetic patients with clinically

diagnosed dermatophytosis were included in this study. Skin, hair and nails were collected aseptically from the patients depending on the clinical symptoms. Direct microscopic examination was done for all the samples with KOH. Irrespective of direct microscopic observation, all collected samples were inoculated on Sabouraud Dextrose agar with chloramphenicol / gentamicin and cycloheximide. One set of SDA was incubated at 37°C and second set at 25°C. The samples were also inoculated on Potato dextrose agar and was incubated at 37°C and at 25°C. The media were incubated for 4 weeks and examined daily in the first week, and twice a week thereafter for any fungal growth. Media not showing growth for 4 weeks were considered as negative for fungal growth. Identification was done on the basis of colony characteristics and microscopic morphology in Lacto phenol cotton blue mount. Antifungal susceptibility testing was done by broth microdilution method according to the CLSI M38 – A2 (2008).

RESULTS

60 diabetic patients with clinically diagnosed dermatophytosis were included in this study. Out of 60 clinically diagnosed dermatophytosis, males were 38 (63.3%) and females were 22 (36.7%), which shows a male predominance. The most common clinical presentation was Tinea pedis in 18 (30%) patients, followed by tinea cruris in 12 (20%), tinea capitis in 11 (18.3%) patients, tinea unguium in 10 (16.7%) patients and tinea corporis in 9 (15%) patients. The sites of specimen collection were: 39 specimens from skin, 11 specimens from hair and 10 specimens from nail.

FIGURE-I CLINICAL PRESENTATION OF DERMATOPHYTOSIS



Of all the 60 specimens that were inoculated in Sabouraud dextrose agar and potato dextrose agar, dermatophyte growth was obtained in 48 (80%) specimens. 12 (20%) specimens were culture negative.

45 (93.8%) isolates belonged to the *Trichophyton* genus. *Trichophyton rubrum* was the predominant isolate in 34 specimens. *T. mentagrophytes* was isolated from 6 specimens. *T. violaceum* was isolated from 3 specimens and *T. tonsurans* was isolated from 2 specimens.

TABLE 1 Isolation of dermatophytes in sabouraud dextrose agar and potato dextrose agar

Dermatophytes	Isolates	No. of isolation (n=48)
Trichophyton	<i>T. rubrum</i>	34
	<i>T. mentagrophytes</i>	6
	<i>T. violaceum</i>	3
	<i>T. tonsurans</i>	2
Microsporium	<i>M. gypseum</i>	1
	<i>M. canis</i>	1
Epidermophyton	<i>E. floccosum</i>	1

TABLE 2 Isolation of dermatophytes species from clinical types

ISOLATES	<i>T. pedis</i>	<i>T. cruris</i>	<i>T. capitis</i>	<i>T. unguium</i>	<i>T. corporis</i>	Total
<i>T. rubrum</i>	14	10	2	1	7	34
<i>T. mentagrophytes</i>	4	1	0	0	1	6
<i>T. violaceum</i>	0	0	3	0	0	3
<i>T. tonsurans</i>	0	0	2	0	0	2
<i>M. gypseum</i>	0	0	1	0	0	1
<i>M. canis</i>	0	0	1	0	0	1
<i>E. floccosum</i>	0	0	0	1	0	1
Total	18	11	9	2	8	48

2 (4.2%) isolates belonged to the *Microsporium* genus. *M. gypseum* and *M. canis* were isolated from 1 specimen each.

Epidermophyton floccosum was isolated from 1 (2%) specimen.

Among the 9 samples collected from tinea corporis, 8 samples were culture positive. *Trichophyton rubrum* was the most commonly isolated dermatophyte in 7 samples, followed by *T. mentagrophytes* in one sample.

In the 12 patients with tinea cruris, 11 were culture positive. *Trichophyton rubrum* was isolated in 10 patients and *T. mentagrophytes* was isolated in one patient.

Of the 18 patients with tinea pedis, all the 18 were culture positive. *Trichophyton rubrum* was isolated in 14 patients and *T. mentagrophytes* was isolated in 4 patients.

Out of the 11 patients with tinea capitis, 9 were culture positive. *Trichophyton violaceum* was isolated in 3 patients, followed by *T. rubrum* and *T. tonsurans* from 2 patients each and *Microsporium gypseum* and *M. canis* from one patient each.

In the 10 patients with tinea unguium, 2 were culture positive which yielded one each of *Trichophyton rubrum* and *Epidermophyton floccosum*.

Among the 48 isolates, 38 were sensitive to griseofulvin, 37 were sensitive to ketoconazole, 28 were sensitive to fluconazole, 39 were sensitive to itraconazole and 41 were sensitive to terbinafine.

DISCUSSION

Dermatophytosis is a common fungal infection in humans and animals. This infection has a global

distribution and is regarded as a public health concern. Generally, individuals from all age groups may present with dermatophytosis, although young adults of both genders are more commonly affected. The frequency of this infection varies, depending on the site of infection, the immunological response of the host, and species of the causal agent. Also, many other factors such as migration patterns, frequent travelling, and lifestyle may affect the epidemiology of dermatophytic infection.

The acquisition of infection depends upon skin surface factors like moisture, local carbondioxide tension and unsaturated transferrin. Zinc containing metalloproteinase is needed for penetration. In diabetic patients, serum glucose concentration is high in epidermis which may favour fungal growth.

In the 60 diabetic patients, the most common clinical presentation was tinea pedis in 30% patients. Legge BS⁴ reported tinea pedis in 40% diabetic patients. In the study conducted by Gamze Akkus et al², tinea pedis was found in 26.3% of diabetic patients.

Trichophyton rubrum is the most commonly isolated dermatophyte in this study. It was isolated in 34 (70.8%) specimens out of the 48 specimens that showed fungal growth. In the study done by Nita Patwardhan⁵ from Aurangabad the isolation rate of *T. rubrum* was 28.12% and in another study the isolation rate was 46% which was done by Isac Alteras and Ety Sary¹ from Israel.

Among the 48 isolates, 38 were sensitive to griseofulvin, 37 were sensitive to ketoconazole, 28 were sensitive to fluconazole, 39 were sensitive to itraconazole and 41 were sensitive to terbinafine. In this study, terbinafine is found to be the most sensitive

drug. 41 (85.4%) isolates were sensitive to terbinafine. This is in accordance with the findings of two different studies by Prabhat Kiran et al⁶ and Samia A Girgis et al⁷ where terbinafine was the most sensitive drug. Terbinafine inhibits squalene epoxidase and suppresses ergosterol biosynthesis. It causes toxic accumulation of squalene in fungal cell wall which leads to killing of the fungus by terbinafine.

CONCLUSION

Dermatophytosis is a significant health problem among patients with diabetes mellitus. The wide prevalence of dermatophytosis is due to the immunosuppressive state of these patients. Dermatophyte infections can be quite severe and have high treatment failure rate among diabetic patients. Early isolation and antifungal sensitivity results will help the clinician to initiate appropriate treatment earlier in diabetic patients with dermatophytosis.

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ETHICAL CLEARANCE

Obtained

CONFLICT OF INTEREST

Nil

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