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Clinicomycological and epidemiological profile of dermatophytosis in a rural referral center

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Abstract

Dermatophytosis infections are of public health importance because of their transmissibility from human to human or from animal to human. In the present study we investigated the clinical pattern of dermatophytosis and species prevalence in a rural area of Haryana, India. Clinically suspected and untreated dermatophytosis cases (n=173) attending dermatology outpatient department over a period of one year (July 2007 to June 2008) included in the study irrespective of their age or gender. Specimens (skin scrapings, hair and nail) were collected from suspected patients (n=173) with dermatophytosis and examined for the presence of fungal elements, cultured, isolated and identified. Of the 173 clinically suspected cases of dermatophytosis, 127 (73.41%) were positive for fungal elements by KOH microscopy and 109 (63%) cases were culture positive. Out of the 109 culture positive cases, tineaunguium was prevalent among the majority of cases (46.78%). *T. rubrum* (58.82%) was the major causative species isolated. The age group most affected was 16-45 years (74.31%) followed by 46 -60 years (15.59%). Also maximum number of patients affected was males (66.05%) than females (33.94%), male to female ratio was 2:1. The isolation rates of dermatophytes (tineaunguium) have been observed to be much higher in this study. The present study also shows the significant difference in clinical pattern of dermatophytosis in Haryana from other parts of north India.

Keywords : Dermatophytosis, fungal elements, *T. rubrum*

Introduction

Fungi are cosmopolitan in distribution. Yet remarkably, only few of them are considered pathogenic. The

pathogenic fungi may give rise to infections in animals and human beings. Most of the agents cause infections of the superficial layers of the integument. Superficial fungal infections are the common skin disease in developed and developing countries. These infections occur in both healthy and immunocompromised patients [1]. The etiological agents consist of dermatophytes, yeasts and non-dermatophytemolds [2]. Dermatophytes are responsible for most superficial fungal infection. Dermatophytes are unique group of fungi that infect keratinized tissue and are able to invade the skin, hair and nail causing dermatophytosis [3]. These are common label for a group of three types of fungus that commonly causes skin disease in animals and humans. They can be categorized into three genera *Trichophyton*, *Microsporum* and *Epidermophyton* [4]. Dermatophytosis common in tropical countries due to the factors like heat, high rate of humidity, over population and poor hygienic conditions [5]. Skin infection due to dermatophytes has become a major health problem affecting children, adolescents and adults. Furthermore, these infections are of public health importance because of their transmissibility from human to human or from animal to human. There are no published reports on the clinicomycological profile of dermatophytosis from Haryana, India. Thus, in the present scenario it is important to review the clinical profile of the organisms causing tinea in this area. The changing profiles of human dermatophytosis among countries have further necessitated the need of analysing the clinical profile of dermatophytes. In the current study we investigated clinical pattern of dermatophytosis and species prevalence in a rural area of Haryana, India.

Materials and methods

The study was conducted over a period of one year (July 2007 to June 2008) in the department of Microbiology, M. M. I. M. S. R, Mullana (Ambala), Haryana, India. Clinically suspected and untreated dermatophytosis cases (n=173) attending dermatology outpatient department constituted the material for the study. They were included in the study irrespective of their age or gender. Detailed

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clinical history including epidemiological parameters was recorded during their visit to the hospital.

Sample collection and processing

Specimens were collected depending on the site of involvement such as skin scrapings, hair and nail. The scraping site was cleaned aseptically with 70% alcohol and scrapings were collected particularly at the advancing borders of the infections with help of sterile scalpel. In hair dermatophytosis, basal root portion of hair was collected by plucking the hair with sterile forceps [6].

The collected specimens were divided into two portions. The first portion of the specimen (skin scrapings and hair specimens) was examined microscopically using 10% potassium hydroxide (KOH), while 40% KOH was employed for hair and nail specimens. The second portion was cultured on Dermatophyte test medium (DTM), Dermatophyte isolation medium (DIM) (HiMedia Laboratories Pvt. Ltd., Mumbai, India) and Sabouraud dextrose agar (SDA) containing chloramphenicol (0.05mg/ml), cyclohexamide (0.5 mg/ml) (HiMedia Laboratories Pvt. Ltd., Mumbai, India) medium. Followed by this it was incubated for 14 days at 22°C to 25°C for DTM and 37°C for DIM. The growth of dermatophytes (with the generation of a pink/ purple color) in the media was noted at 10 to 14 days. Color changes found after 14 days were discarded. One of the simultaneously inoculated tubes of Sabouraud dextrose agar (SDA) incubated at 22°C to 25°C and the other at 37° [7].

Identification of organisms

The mycological identification was based on macroscopic and microscopic examination of the culture isolates. The macroscopic examination of dermatophytes were characterized by colony morphology, pigment production on the surface, reverse of colonies and duration of growth. The microscopic examination of fungal growth was observed with lactophenol cotton blue preparation to detect the presence of macroconidia, microconidia and special hyphal structures. In addition, biochemical tests such as urease production, in vitro hair perforation and nutritional requirement tests were carried out to distinguish between the species [8].

Results

Of the 173 clinically suspected cases of dermatophytosis, 127 (73.41%) were positive for fungal elements by KOH microscopy and 109 (63%) cases were culture positive. Eighteen patients were positive for dermatophytes by direct microscopy but negative on culture (Table 1). The 109 culture positive cases were analysed. On the basis of clinical pattern, tinea unguium was prevalent among the majority of cases (46.78%). Tinea corporis was the second

predominant infection observed (20.18%) followed by tinea mannum (15.59%), tinea pedis (10.09%), and tinea capitis (5.5%). Tinea barbae (1.8%) was the least among the cases in the present study (Table 1).

T. rubrum (58.82%) was the major causative species isolated, followed by *T. mentagrophyte* (27.45%) and *T. tonsurans* (11.76%) from tinea unguium patients. *T. rubrum* (54.54%) was the commonest etiological agent isolated from tinea corporis patients followed by *T. mentagrophyte* (18.18%) and *T. schoenleinii* (13.63%) (Table 2).

Among the dermatophytes isolated on culture *T. rubrum* was the most frequent species (54.12%), followed by *T. mentagrophyte* (26.60%), *T. tonsurans* (11.92%), *T. schoenleinii* (5.50%). The least isolated were *E. floccosum* (0.9%) and *M. audouinii* (0.9%) (Table 2).

The age of the patients ranged from 1-60 years. The highest prevalence of dermatophytosis was found in the age group of 16-45 years (74.31%) followed by age group of 46 -60 years (15.59%). *Tinea unguium* (51.85%) was the predominant clinical pattern in 16-45 year age groups followed by *Tinea corporis* (18.51%), *Tinea mannum* (13.58%), *Tinea pedis* (11.11%) and *Tinea capitis* (2.4%). *Tinea barbae* infection was found to be restricted only to 16-45 years age group (Table- 3).

The analysis of the sex wise distribution of dermatophytosis revealed that, maximum number of patients affected were males (66.05%) than females (33.94%). The incidence of dermatophytosis in male to female (male to female ratio) in the current study was 2:1. Tinea unguium and tinea corporis was seen predominantly in males (53.57%, 8.18%) when compared to females (3.75%, 1.81%) (Table 4).

Discussion

Dermatophytosis has become one of the most common human infectious diseases in the world. Although dermatophytosis does not cause mortality, it does cause morbidity and possess a major public health problem [7]. The results of the present study indicate that dermatophytosis is the common skin disease in the rural population in and around Haryana, India. Among the 173 patients with dermatophytosis, 127 (73.41%) cases were positive for KOH mount. The total isolates obtained from these cases were 109 (63%). This shows that, the isolation rate in this study seemed to be higher when compared to various other reports where it has ranged from 45.3% -52.2% [8-10]. Firstly it should be noted that some clinical specimens were positive by direct microscopy but negative on culture. Even though the specimens were collected and processed carefully, the same type of result

Table 1. Clinical types of dermatophytosis

| Isolation of dermatophytes according to the clinical types | | | |
|---|--------------------------|--|--|
| Clinical types | Total no of cases | No of cases positive by KOH mount | No of cases positive by culture |
| <i>Tinea unguium</i> | 66 | 57 | 51 |
| <i>Tinea corporis</i> | 34 | 25 | 22 |
| <i>Tinea pedis</i> | 21 | 13 | 11 |
| <i>Tinea mannum</i> | 26 | 20 | 17 |
| <i>Tinea capitis</i> | 17 | 08 | 06 |
| <i>Tinea barbae</i> | 09 | 04 | 02 |
| Total | 173 | 127 | 109 |

Table 2. Distribution of different species of dermatophytes as per clinical pattern

| Distribution of different species isolated as per clinical pattern | | | | | | |
|---|-----------------|------------------------|--------------------|-----------------------|--------------------|--------------------|
| Clinical types | <i>T.rubrum</i> | <i>T.mentagrophyte</i> | <i>T.tonsurans</i> | <i>T.schoenleinii</i> | <i>E.floccosum</i> | <i>M.audouinni</i> |
| <i>Tinea unguium</i> | 30 | 14 | 06 | - | 01 | - |
| <i>Tinea corporis</i> | 12 | 04 | 02 | 03 | - | 01 |
| <i>Tinea pedis</i> | 07 | 03 | 01 | - | - | - |
| <i>Tinea mannum</i> | 10 | 05 | 02 | - | - | - |
| <i>Tinea capitis</i> | - | 01 | 02 | 03 | - | - |
| <i>Tinea barbae</i> | - | 02 | - | - | - | - |
| Total | 59 | 29 | 13 | 06 | 01 | 01 |

Table 3 Dermatophytoses in relation to age

| Age wise distribution of culture positive cases | | | | |
|---|-----------|-----------|-----------|-------------------------------|
| Clinical types | 0-15 | 16-45 | 46 -60 | Total no of culture positives |
| <i>Tinea unguium</i> | 04 | 42 | 05 | 51 |
| <i>Tinea corporis</i> | 01 | 15 | 06 | 22 |
| <i>Tinea pedis</i> | - | 09 | 02 | 11 |
| <i>Tinea mannum</i> | 02 | 11 | 04 | 17 |
| <i>Tinea capitis</i> | 04 | 02 | - | 06 |
| <i>Tinea barbae</i> | - | 02 | - | 02 |
| Total | 11 | 81 | 17 | 109 |

Table 4. Sex wise distributions of dermatophytoses

| Sex wise distribution of culture positive cases | | |
|---|-------------------|---------------------|
| Clinical types | Incidence in male | Incidence in female |
| <i>Tinea unguium</i> | 30 | 21 |
| <i>Tinea corporis</i> | 18 | 04 |
| <i>Tinea pedis</i> | 09 | 02 |
| <i>Tinea mannum</i> | 09 | 08 |
| <i>Tinea capitis</i> | 04 | 02 |
| <i>Tinea barbae</i> | 02 | - |
| Total | 72 | 37 |

could be obtained due to a number of reasons; 1) This might be due to the therapy which has already been carried out in this area, 2) or it could be due to an area of the infected part without viable hyphae was sampled, 3) or it might also be due to the transportation of local antifungal material into media when the sample was cultured. The variations in KOH mount as well as culture positivity was supported by various earlier reports [11].

In current study we found that, *Tinea unguium* (infection of the nail plate) was the commonest clinical type isolated followed by *Tinea corporis*. One of the unique finding of current study is that the high prevalence of tinea unguium in the Haryana population. *Tinea unguium* is a fungal infection of the nails. It most commonly affects the toenails, rarely the fingernails. *Tinea* of the toenail occurs most often in patients with recurrent attacks of tinea of the feet. It is seen most often in the elderly but can be seen in young adults and immunosuppressive patients (HIV, drug induced). This finding is in contrast with previous studies conducted elsewhere in North India. Their report suggests that, *Tinea corporis* was the most common dermatophytosis followed by tinea cruris [12, 13]. The higher incidence of tinea unguium in Haryana population could be due to the patient's direct and indirect interaction with animals and their products (leather, wool) during farm works and animal husbandry, in addition to the existence of domestic pets.

Tinea capitis (Scalp ringworm) is less common in India when compared to other countries [13]. The incidence of *Tinea capitis* infection was relatively lower in the present study which is comparable with reports from other studies [14]. This could be due to the use of hair oils by Indians and have been shown to inhibit the effects of dermatophytes *in vitro* [15]. Reports suggest, the incidence of *Tinea pedis* was less in India compared to western countries. In the current study also we found this as the fourth highest (~10.09%) causative organism. The probable reason for this reduced incidence could be due to their life style. Majority of patients who came for treatment was from rural area (most of them were farmers) and was observed to be bare footed. In contrast, the predominance of *Tinea pedis* in western countries might be due to the regular use of shoes and socks, which causes dampness especially in the toe webs and interdigital regions.

T. rubrum was the predominant isolate from the nail clippings and glabrous skin of the body, palm and feet (54.12%). *T. mentagrophyte* was the second common isolate from the body sites. The findings are endorsed by earlier reports [16]. The isolation rate of *T. tonsurans* (11.92%) is also higher in this study as

compared to other studies [17]. *T. tonsurans* emerged out to be the third dominant isolate. In the present study, the incidence of human infection by the genus *Epidermophyton* and *Microsporum* was account for lower percentage as compared to *Trichophyton* species.

The prevalence of above clinical pattern of dermatophytosis was found to be more in males than females in our study. This probably due to exhausting physical activities under the sun, which leads to increased sweating and making a favorable environment for the fungal infections. Moreover, wearing of tight synthetic clothes could lead to increased dampness and warmth of the body, facilitating the skin surface suitable for the growth of dermatophytes. These observations were supported by a number of earlier reports [18].

Dermatophyte infection is more common in adults. In the present study, most of the clinically suspected cases of dermatophytosis were in the economically active age group (16–45 years). Reports suggests that, this group is more prone to fungal infections due to increased environmental exposure (hot, humid) and hormonal changes [8]. Environmental conditions play a key role in the development of dermatophytosis. Haryana has a hot, humid climate for most of the months in a year. This area also receives heavy rainfall during monsoon season. These environmental conditions might have favored the development of superficial mycosis in this population. Furthermore, the poor hygiene as well as the direct contact with soil might be other crucial factors facilitated the development of this disease in this population. Although the current study is an eye opener, this study could be extended using a larger sample size to evaluate other factors influencing the development of superficial mycosis in Haryana population.

Conclusion

The study reveals that, the commonest clinical pattern presented to us was tinea unguium and the prevalence was also very high. *T. rubrum* was the predominant species responsible for most of the clinical pattern of dermatophytosis. Isolation rate of dermatophytes have been observed to be much higher in this study. The present study also shows the significant difference in clinical pattern of dermatophytosis in Haryana from other parts of north India.

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