A 10-Year Study of Dermatophytoses in Isfahan, Iran

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Dermatophyte infections are very common worldwide and their epidemiological characteristics vary according to the geographical region and have altered in the last decades. The aim of the present investigation was to determine the diversity of causative agents of dermatophytoses and describe the epidemiological condition of infection in Isfahan, Iran, between 2003 and 2012. Specimens were collected from hair, nail, and skin and were examined by conventional methods such as direct microscopy, culture on sabouraud dextrose agar with chloramphenicol and cycloheximide (Mycosel agar) and sabouraud glucose agar, *Trichophyton* agars, growth on rice grains, urease test, and hair perforation test. Of 13,469 clinically

suspected cases, 11.5% were affected with dermatophytoses. Tinea capitis was the most frequent form of infection (52.7%), followed by tinea corporis (24%), tinea pedis (8.9%). *Trichophyton verrucosum* was the most prevalent causative agent (40.6%), followed by *T. mentagrophytes* var. *interdigitale* (17.6%), *Epidermophyton floccosum* (13%), *T. violaceum* (12%), *T. rubrum* (4.1%). Age range of patients was between 1 and 80 years. Housewives were the most patients in our study. The study emphasizes importance of epidemiological surveys of dermatophyte species for the better management of infection. J. Clin. Lab. Anal. 30:103–107, 2016. © 2015 Wiley Periodicals, Inc.

Key words: dermatophytoses; *T. verrucosum*; Isfahan, Iran

INTRODUCTION

Dermatophytoses are worldwide common fungal infections caused by filamentous fungi belonging to the three anamorphic (asexual) genera: *Trichophyton*, *Microsporum*, and *Epidermophyton*. Fungi in all three categories may cause human infections. They are characterized by their ability to invade the superficial layers of the epidermis, especially, the stratum corneum and the high keratin—concentration including the hair and nails of the host (1). A number of factors including geographic position, climate, overcrowding, health care, the presence of domestic animals, age of the individual, changes in socioeconomic condition of the people, and immigration have great effect on the epidemiology of dermatophytoses (2). The growing number of immunosuppressed patients, for example, who suffer from cancer, diabetes mellitus, AIDS, and organ transplantation, has given these infections more importance (3, 4). About 20–25% people around the world present with cutaneous infections such as dermatophytoses (5). Due to differences of antifungal susceptibility profile of dermatophyte species (6, 7), epidemiological investigations and identification of dermatophytes can be helpful for controlling of this fungal

infection. The aim of this study is determination of the frequency of dermatophytoses and identification of dermatophyte species in patients during 2003–2012 in Isfahan, the central city of Iran.

MATERIALS AND METHODS

A total of 13,469 suspected cases (6,672 male and 6,797 female) of dermatophytoses, referred to the central medical mycology laboratory associated with Isfahan University of Medical Science from January 2003 to December 2012, were evaluated in this study. Age, gender, job, clinical signs, and site of involvement were documented for each subject. Patients who had taken antifungal agents during the last week were kept out from our

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Fig. 1. Distribution of different forms of dermatophytoses according to the gender of patients.

study. Skin scrapings, nail clippings, and affected hairs were collected in sterile Petri dishes to obtain substances for direct microscopy and culture. A part of samples were treated with 20% potassium hydroxide (KOH) for consideration of fungal components such as mycelium, and arthroconidia, in direct microscopy. Another part of specimens were inoculated into sabouraud dextrose agar with chloramphenicol and cycloheximide (Mycosel agar; Difco, Detroit, MI), and also into the medium without antibiotics (sabouraud glucose agar, Difco), and incubated at 25°C. Cultures were examined “periodically” for the fungal growth up to 3 weeks. Several additional tests such as nutritional tests (Trichophyton agars; (BIOMARK, India), urea hydrolysis (QUELAB, Canada), growth on rice grains, and hair penetration test were used to verify our identification (8,9).

RESULTS

In the period 2003–2012, among 13,469 suspected cases of dermatophyte infections, 1,548 patients (11.5%) were actually found to be affected with dermatophytoses. Tinea capitis had the highest incidence of dermatophytosis (52.7%), followed by tinea corporis (24%), tinea pedis (8.9%), tinea cruris (7%), tinea unguium (4%), tinea manuum (2.8%), and tinea faciei (0.4%, Fig. 1). Nine hundred eighty-three patients (63.5%) were female, and 565 (36.5%) patients were male. Age range of patients of the study was between 1 and 80 years (mean age, 42 years). Patients in the age groups of 41–50 and 71–80 years had the highest and lowest frequencies of positive samples, respectively (Table 1). From positive cases in direct microscopy, 693 (44.8%) samples were randomly cultured. Of 693 cases of cultures, 16 cases (2.3%) did not grow due to unknown factors such as use of antifungal agents,

TABLE 1. Age Range of Patients With Dermatophytoses Isolated From Isfahan, Iran, During 2003–2012

Age range	Male	Female	Total (%)
0–10	11	62	73 (4.7)
11–20	17	85	102 (6.5)
21–30	53	199	252 (16.3)
31–40	155	146	301 (19.4)
41–50	145	237	382 (24.7)
51–60	147	183	330 (21.3)
61–70	29	28	57 (3.7)
71–80	8	43	51 (3.3)
Total	565	983	1548 (100)

washing the lesions, and insufficient sample. The most prevalent dermatophyte species was *Trichophyton verrucosum* (40.6%), followed by *T. mentagrophytes* var. *interdigitale* (17.6%), *Epidermophyton floccosum* (13%), *T. violaceum* (12%), *T. rubrum* (4.1%), *T. schoenleinii* (4%), *Microsporum canis* (2.8%), *T. mentagrophytes* var. *mentagrophytes* (2.5%), *M. gypseum* (1.8%), *T. tonsurans* (1.5%), *M. cookei* (0.1%, Table 2). Housewives were the commonest dermatophytosis-infected population (32.4%). Figure 2 shows the occupation of patients enrolled in our investigation. The mean number of positive samples of dermatophytoses recognized per year was 335 in 2003–2004, 272 in 2005–2006, 297 in 2007–2008, 337 in 2009–2010, and 307 in 2011–2012. Figures 3 and 4 divided the frequency of clinical forms of dermatophytoses into the five stages.

DISCUSSION

Dermatophytic infection is a frequent disease that comprises public health problem among people throughout the world. Surveys of dermatophytoses have shown differences in patterns of the etiologic agents worldwide (1,9). The distribution of dermatophyte species fluctuates with geographical area and is affected by different parameters, such as the kind of society, lifestyle, weather conditions, migration, socioeconomic conditions, and drug therapy (2,10). Some dermatophyte species such as *T. rubrum* and *T. mentagrophytes* distributed worldwide but others such as *T. soudanense* and *T. concentricum* have geographic limitation (11,12). In the present study, we investigated the frequency of dermatophytoses and their etiological agents in Isfahan, Iran, in a period of 10 years. In the present study, most isolates could be obtained from scalp/scalp hair (52.7%) and skin specimens (24%), and the isolates were obtained from hand (2.8%) and face scales (0.4%), were at least. These findings are in agreement with our previous studies presented the prevalence of dermatophytoses in Isfahan, Iran, between 1983 and 1993 (13,14). *T. verrucosum* was the most prevalent species in present

TABLE 2. Dermatophyte Species Isolated From Patients in Isfahan, Iran, From 2003 to 2012

Dermatophyte species	Tinea capitis	Tinea corporis	Tinea pedis	Tinea cruris	Tinea unguium	Tinea manuum	Tinea faciei	Total
<i>T. verrucosum</i>	157	114	0	0	0	3	1	275
<i>T. mentagrophytes</i> (var. <i>interdigitale</i>)	7	15	49	11	32	5	0	119
<i>E. floccosum</i>	0	2	12	66	5	3	0	88
<i>T. violaceum</i>	59	19	0	0	0	2	1	81
<i>T. rubrum</i>	0	5	15	3	5	0	0	28
<i>T. schoenleinii</i>	19	6	0	0	0	1	1	27
<i>M. canis</i>	12	6	0	0	0	0	1	19
<i>T. mentagrophytes</i> (var. <i>mentagrophytes</i>)	7	6	0	0	0	3	1	17
<i>M. gypseum</i>	8	3	0	0	0	0	1	12
<i>T. tonsurans</i>	7	1	0	0	0	1	1	10
<i>M. cookei</i>	1	0	0	0	0	0	0	1
Total	277	177	76	80	42	18	7	677

Fig. 2. Distribution of patients with dermatophytoses according to their occupation.

study (40.6%), whereas Khosravi et al. (15) found 11.5%. The high incidence of *T. verrucosum* in Isfahan is surprising, maybe because the reservoir of this fungus is in livestock in Isfahan, which is transmissible from animals to man (8). Many of these patients in their medical history reminded a direct or indirect contact with infected animals. In contrast with some studies that have reported *T. rubrum* as a chief isolate of skin scales (16, 17), in the present study *T. verrucosum* was the main species isolated from tinea corporis. Havlickova et al. (2) reported *T. rubrum* as the most common cause of tinea pedis worldwide, whereas *T. mentagrophytes* var. *interdigitale* was the principal agent of tinea pedis in our investigation. We can see high prevalence of *T. rubrum* in many investigations that have reported from different places in Asia (18–20), but this species caused only 4% of total infection in present study. Recent epidemiological surveys of dermatophytoses in European countries have approved

Fig. 3. Frequency of tinea capitis, tinea corporis, and tinea pedis during 2003–2012.

the increasing of tinea unguium (21, 22) while this clinical form of infection included only 4% of dermatophytoses in the present study. According to our previous study (23), *T. mentagrophytes* var. *interdigitale* was the commonest etiological agent of tinea unguium. *Trichophyton violaceum* was the most frequent isolate in the study carried out in Tehran, Iran, by Lari et al. (24). They also showed tinea capitis (39.6%) as the commonest dermatophytosis, similar to our study (40.9%). Interestingly, we obtained an isolate of *T. cookei* from a patient with body lesion. As far as we know, such a case has not been isolated from tinea corporis in Isfahan in the past. Rezaei-Matehkolahei et al. (25) identified 777 dermatophyte strains by molecular techniques. They reported tinea pedis and *T. interdigitale* as the most prevalent type of infection (43.4%) and the commonest isolate, respectively. Falahati et al. (26) showed *Epidermophyton floccosum* as the most prevalent dermatophyte species in Tehran, and tinea corporis as the most common dermatophytosis, whereas *T. verrucosum* and tinea capitis are at the head of our ranking in present

Fig. 4. Frequency of tinea cruris, tinea unguium, tinea manuum, and tinea faciei during 2003–2012.

survey. Aghamirian et al. (27) reported *E. floccosum* as the most frequently isolated species representing 32.8% of isolates in Qazvin, Iran. The most common type of infection in their study was tinea cruris (31.9%), affecting in particular male patients. In accordance with present study, Naseri et al. (28) revealed that *T. verrucosum* was the most prevalent species in the study they performed in Mashhad, a city in northeast of Iran, and tinea corporis (33.1 %) was the most prevalent type of dermatophyte infection. Many research studies have been conducted on dermatophyte species and dermatophytoses, which generously make our awareness on the epidemiology of these infections better, but there are irregularly helpful steps for controlling of known infection sources obtained from these investigations. With growing frequency of fungal infection, drug resistance to the existing antifungal agents (29–31), and cost and side effects of drugs, there is a great requirement for an uninterrupted epidemiological surveys.

From this study we conclude that the high prevalence of *T. verrucosum* in Isfahan can be related to poor hygienic condition and infected animals. Preventive measures in livestock and improved conditions of life and hygiene should be able to reduce *T. verrucosum* in this region.

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