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Dermatophytosis in Western Part of Iran, Khorramabad

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Abstract: This study was carried out with the purpose of determining the genus and species of regional dermatophytes and its importance in providing the ways for preventing these diseases. The study was established as census during a one year period (from 2007 through 2008). Questionnaires were completed for recording necessary information by 294 patients suspected of dermatophytosis and then samples from skin, nail and hair were obtained. All of the specimens were assessed by two methods, direct and culture. The obtained results were analyzed by SPSS 15 software. One hundred and seventy two patients showed different kinds of dermatophytosis. The age average was 23.5 years and the number of affected men was more than that of women. Only *Tinea manuum* in women was more than in men. Most kinds of dermatophytosis were *Tinea corporis* (25.6%) and *Tinea cruris* (25%). Epidermophyton floccosum and trichophyton verrocosum were the most common dermatophytes of the region. Control and prevention of these diseases and also preclusion of the economic losses in regional husbandry industry will be fulfilled. Moreover, definitive diagnosis of dermatophytosis before initiating the therapy and public education concerning this disease can be very effective in reducing the infection rates.

Key words: Dermatophytosis, Khorramabad, Iran

INTRODUCTION

Dermatophytes are keratinophilic fungi and uniquely capable invade to hairs, nails and skin (dermatophytosis). This specific aspect is due to the ability of production of Keratinase to digest the Keratin and generate the manan in the cell wall which inhibits the immune system (Dismukes *et al.*, 2003). The manifestations of the lesions vary and are very similar to those of some other skin diseases. Although the invasion of these fungi is mostly limited to the keratinized layer of skin and its components, but infection is also possible in deeper areas involving derma (Richardson and Warnock, 2003). Moreover, they rarely cause

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systemic infections (Murray *et al.*, 1999). The most common mechanism of immunological defense in dermatophytosis is type 4 delayed hypersensitivity reactions (Bicer *et al.*, 2003). Apparently humeral immunity has no role in the elimination of the infection, cause of the highest level of antibodies exist in the patients with chronic Dermatophytosis infections (Fidel and Huffnagle, 2005). As yet, more than 40 dermatophytes strains have been identified which are collectively put inside three genera, Microsporum, Trichophyton and Epidermophyton. Ninety percentages of chronic dermatophytosis infections is due to *T. rubrum* (Campos *et al.*, 2006). Dermatophytosis has a worldwide distribution so that one can not find a region free of Tinea (ringworm). This disease has always caused such problems as pain, suffering, inability, waste of time and high therapy expense in humans and is a significant hygienic issue in animals, which brings about many casualties in their products (wool, skin, meat, etc.). Nowadays, 20-40% of the world populations are infected by these organisms. To diagnose dermatophytosis, both physician and mycologist have to be familiar with the regional dermatophytes and occurrence. This information is extractable from the results of tests and daily culture of patient's samples in laboratory (Shadzi, 2004).

Regarding the above studies, high prevalence of dermatophytic infections and presence of various genera and strains of dermatophytes in our country (Aghamirian *et al.*, 2002) and in the world (Anaisse *et al.*, 2003), it is necessary to assess this disease in age, sex and job groups in the city of Khorramabad, particularly taking into consideration the hygienic, economic and climatic conditions. In addition to find the definitive diagnosis, we were determined through this research to identify the prone groups from age, sex, education, environmental and occupational factors and hygienic behaviors standpoint. With this it may be possible to reach effective approaches for preventing and eliminating the causative pathogen regarding the genera and strains of the determined dermatophytes (anthrophilic, zoophilic and geophilic).

MATERIALS AND METHODS

The study was established on a cross-sectional census basis and carried out on 294 patients with probable diagnosis of dermatophytosis who were referred by Dermatologists to Mycology Laboratory of Medical Faculty in Lorestan University of Medical Sciences, from July 2007 to July 2008. Sampling was carried out after completing the questionnaires containing necessary information.

Sampling

- **Hair sample:** About 40 hairs were removed by means of a pair of tweezers
- **Skin sample:** This was prepared from cutting the areas surrounding the lesions by a sterile surgical blade (scalpel No. 15)
- **Nail sample:** Firstly the infected nail was cut short by means of a sterile nail-trimmer down to the unaffected border, then by means of a sterile scalpel, lops were prepared and the obtained stuff from the first cuts were discarded and the second cuts were used for the tests. In *Tinea unguinum*, the sample is usually taken from the end of the nail. In all cases the infected area was first cleaned with 70% alcohol

Direct Method

A number of removed hairs (Aghamirian *et al.*, 2002; Berenji *et al.*, 2002) were transferred onto a clean slide containing two drops of lactophenol and the slide was covered with a

cover-glass. Some of the crusts were placed on a clean slide, 20% potassium chloride was added and the slide was covered by a clean cover-glass. The nail samples were treated just like prepared crusts. The prepared sample was placed inside a plate containing 5 mL distilled water which in turn was put on a u-shaped tube to render the nail sample clear more rapidly. The sample was then removed and heat treated lightly by passing it 3-4 times over a flame. Hair sample and skin scratches usually turn clear after 5 min to one hour but as to nail sample a 1 or 2 day time is required. Finally, the preparations (slides) were examined under a microscope with low (x10) and high (x40) resolution.

Culture

All suspected samples were cultured irrespective of the result of direct examination. Each sample was cultured on a mycobiotic agar (Difco, UK) plate by means of a sterile platin curved-tip rod and all plates were incubated in 28°C for 4-6 weeks, with the exception of samples suspected of infection by *T. verucosum* (based on history of the patient and contact with cows) that were also incubated in 37°C (because their growth will be more rapid in this temperature). Cultures were scrutinized every 2-3 days for any mark of growth. Following appearance of colonies suspected of dermatophytes, they were subcultured in fresh mycobiotic agar to avoid any contamination and to promote accurate identification. Negative or contaminated plates were reinoculated.

Identification

To identify dermatophytes, we should be focused on assessing the appearance of their colonies and their microscopical structure. The appearance of colonies from the growth standpoint, surface view of the colony, pigments produced, color of colonies were evaluated both on front and back of the plate. To assess microscopically the presence, shape and arrangement of micro- and macro-conidia, we prepared teased mount slides and wherever necessary culture on PDA (potato dextrose agar). Additionally, biochemical (urease) and physiological (ear piercing *in vitro*) tests and culture on PDA for definitive diagnosis particularly for trichophytions, were used (Fisher and Cook, 1998).

Statistical Analysis

The collected data were analyzed through SPSS 15 software and in order to analysis the data, various statistics test were adopted.

RESULTS

In this study, 294 patients consisting of 177 males and 117 females referred to the laboratory. Direct testing of samples showed that 172 patients (58.5%) were infected by various kinds of dermatophytes, this figure comprised 63.4% male and 36.6% female. Age spectrum of patients was 2-74 years and with an average of 23.5. Most and least cases of dermatophytosis were of patients in age group 20-29 (35%) and more than 50 years old (5.2%), respectively. *Tinea corporis* (25.6%) was the most common ringworm infection and other *Tinea* had in decreasing order the following frequencies: *Tinea inguinal* (25%), *Tinea manium* (19.2%), ectothrix ringworm (8.7%), *Tinea facie* (6.4%), *Tinea pedis* (3.5%) and endothrix ringworm (2.3%). The frequencies of combined infections were as follows: *Tinaea manium* and *pedis*, *Tinea unguinum* and *testis*, *Tinea unguinum* and abdominal, 1.7% each, *Tinea unguinum* (1.2%), *Tinea inguinal* and *agzillar*, hand and ear, hand and

Table 1: Frequency distribution of 172 patients with dermatophytosis in the city of Khorramabad, from 2007 through 2008, based on season and site of infection

Site of infection	Season				Total
	Spring	Summer	Autumn	Winter	
Head					
Number	3.0	5.0	2.0	9.0	19
Percentage	15.8	26.3	10.5	47.4	100
Trunk					
Number	12.0	8.0	9.0	15.0	44
Percentage	27.3	18.2	20.5	34.1	100
Beard					
Number	1.0	0.0	0.0	0.0	1
Percentage	100.0	0.0	0.0	0.0	100
Face					
Number	4.0	1.0	4.0	2.0	11
Percentage	36.4	9.1	36.4	18.2	100
Hand					
Number	6.0	10.0	14.0	8.0	38
Percentage	15.8	26.3	36.8	12.1	100
Groin					
Number	4.0	22.0	14.0	10.0	50
Percentage	8.0	44.0	28.0	20.0	100
Foot					
Number	2.0	1.0	2.0	2.0	7
Percentage	28.6	14.3	28.6	28.6	100
Nail					
Number	0.0	1.0	0.0	1.0	2
Percentage	0.0	50.0	0.0	50.0	100
Total					
Number	32.0	48.0	45.0	47.0	172
Percentage	18.6	27.9	26.2	27.3	100

neck, foot and neck, 0.6% each. Tinea cases related to inguinal, capitis, corporis (trunk), face and pedis were more common in men than in women, whereas *Tinea manium* was more common in women. The age range of the most common group with *Tinea inguinal*, *Tinea manium* and *Tinea unguinum* was 20-29 years, *Tinea corporis* and facie 10-19 and that of *Tinea pedis* was 30-39, while *Tinea capitis* was in age range of 0-9 years. Direct testing of samples revealed 172 cases of dermatophytosis out of 294 patients (58.5%). One hundred and fifteen cases (66.9%) out of 172 cases, had positive cultures, 57 cases (33.1%) had negative culture result. No case with a negative direct test and positive culture was observed. Most cases of *Tinea capitis* and *Corporis* were observed in Winter and those of *Tinea inguinal* and *Tinea manium* in Summer and Autumn, respectively. The most frequent cases of Tinea were in decreasing order in seasons: Summer (27.9%), Winter (27.3%), Autumn (26.2%) and Spring (18.6%) (Table 1).

Maximum percent of morbidity was determined to be in individuals under diploma (high school certificate) (37.2%) and the minimum in persons with associate degree (4.7%) and in uneducated persons (25%). Out of total 172 patients, 19.8% had contact with cow, 18% with sheep, 5.8% with goat, 1.7% with dog, 6% with cock and the remainder (54.1%) did not announce any contact with animals. In one case the patient was suffering from diabetes. The most common clinical features were ring-shaped (87.2%) and salty and dried (69.8%) lesions. Epidermophyton floccosum and *T. verucosum* were diagnosed as the most common dermatophytes of the region. No agent belonging to the genus Microsporum was isolated (Table 2).

Table 2: Frequency distribution of 172 patients with dermatophytosis in the city of Khorramabad, from 2007 through 2008 based on fungal genus and strain, lesion site and type of the test

Dermatophytosis	Lab. tests		Genera and strains of dermatophytes						Total patients
	Direct	Culture	Ef	Tv	Tvi	Tm	Tr	Tsch	
Head	1	1	0	0	0	0	1	0	1
Trunk	4	7	0	1	0	1	2	0	7
Beard	5	11	1	4	0	0	0	0	11
Face	25	38	1	14	6	1	3	0	38
Hand	16	19	0	13	3	0	0	0	19
Groin	45	50	43	1	0	0	1	0	50
Foot	1	2	0	0	0	0	1	0	2
Nail	18	44	0	10	0	1	6	1	44
Total	115	172	45	43	9	3	14	1	172

Ef: *E. floccosum*, Tv: *T. verucosum*, Tvi: *T. violaceum*, Tm: *T. mentagrophytes*, Tr: *T. rubrum*, Tsch: *T. schoenlini*

DISCUSSION

Dermatophytes have got the ability to degrade the surface keratin of skin, hair and nail and are able to invade humans, animals or both. Dermatophytes cause a wide spectrum of clinical features varying from mild to severe that are affected by such factors as dermatophyte strain, volume of inoculum, site of infection and host immune system (Anaisse *et al.*, 2003).

In this study, dermatophytosis was more prevalent in men (63.4%) than in women and most of patients were in the age range of 20-29 years, which conforms to the results of some researches in Iran (Mohmoudabadi, 2005; Aghamirian *et al.*, 2002). Although, dermatophytosis occurs in all ages, but the rate of infection is dependent upon such factors as climates, cultures and traditions in societies, occupations, hygienic status and exposure to domestic animals. Densely populated areas, the amino acid composition of sweat, lipids of the skin and hormones also play a role (Brooks *et al.*, 2004). Additionally, use of topical steroids, damage to epiderm, metabolic or endocrinal disorders and HIV infection may be implicated (Anaisse *et al.*, 2003).

In this research, dermatophytosis forms were *Tinea corporis*, *Tinea unguinum* and *Tinea manium*, with *Tinea corporis* being the most common form (Table 1). Khosravi *et al.* (1994) reported *Tinea capitis* as the most prevalent form in Iran. Falahati *et al.* (2003) in Tehran reported as the most common form *Tinea corporis* and thereafter in decreasing order of prevalence, *Tinea unguinum*, *Tinea pedis*, *Tinea manium*, *Tinea facialis* and *Tinea unguinum* (Falahati *et al.*, 2003). Mahmoodabadi (2005) in Ahwaz reported as the most common form *Tinea unguinum* followed by, in decreasing prevalence, *Tinea pedis*, *Tinea corporis*, *Tinea unguinum*, *Tinea capitis*, *Tinea facie* and *Tinea barbae*. Berenji *et al.* (2002) in Mashad reported *Tinea corporis* as the most common form of dermatophytosis and *Tinea barbae* as the least one. Aghamirian *et al.* (2002) in Ghazvin reported that *Tinea unguinum* was the most common form and *Tinea corporis* ranking the second position (Aghamirian *et al.*, 2002). In present study, *Tinea unguinum* was more prevalent in men than in women and most of the affected men were in the 20-29 age range. Mahmoodabadi (2005) reported similar findings. This form of dermatophytosis was mainly observed in jobless people, employees and individuals with free jobs and was least common in athletes. This form of disease is usually known as the disease of sedentary people. *Epidermophyton floccosum* was the causative agent in 86% of cases. This fungus has also been reported by some other researchers as the most common dermatophyte from all inguinal isolates (Mohmoudabadi, 2005; Aghamirian *et al.*, 2002; Hashemi *et al.*, 2004; Omidynia *et al.*, 1996). Regarding the studies performed in the Southern part of Tehran in 2003, the incidence and prevalence rates of dermatophytosis per 100000 people have been reported as to be

10.6 and 13.5, respectively, with epidermophyton floccosum as the most common isolate (Falahati *et al.*, 2003). In other countries (America, Kuwait, Italy, Jordan, Poland) this disease has also been studied from different aspects such as prevalence, incidence, types of *Tinea*, types of isolates, etc. (Abu-Elteen and Malek, 1999; Lange *et al.*, 2004).

In present study, most of persons affected by *Tinea capitis* have mentioned contact with domestic animals (cow, sheep, calf and goat) which are important factors in infections with zoophilic dermatophytes. Patients have pointed to some traditional and local therapies for themselves or their domestic animals, such as use of burned car oil, mixture of sulphur and yoghurt and local pistacia (pistacia-khinjuk). *Tinea manium* with the third position in prevalence was more common in the age group 20-29 and the only dermatophyte affecting 1.7 times as many women as men. Most affected women were housewives inhabiting in villages and had contacts with cows and sheep. The most important causative agent of this tinea in present study was *T. verucosum*, whereas in the study of Mahmoodabadi (2005) in Ahwaz the disease was 1.6 times as common in men as in women and the causative agent was reported to be *T. mentagrophytes*. In the study of Falahati *et al.* (2003), the morbidity in men has also been reported to be more than that in women. Hashemi *et al.* (2004) have reported *T. rubrum* as the only agent of *Tinea manium*. Hernandez-Salazar *et al.* (2007) reported that infection with *T. rubrum* in a 10 year period in Mexico City is mostly in 3-5 decades of life and in housewife women. *Tinea rubrum* was reported as most common dermatophytes isolate in a 7 year survey (1997-2003) in Greece Crete (Maraki *et al.*, 2007). *Tinea barbae* was observed only in one case (0.6%), the affected was an 18 years old youth residing in the city, jobless and wrestler. The causative agent was recognized to be *T. rubrum*. Mahmoodabadi (2005) has reported *Tinea barbae* in two farmers in Ahwaz (1.7%) caused by *T. verucosum* and *T. canis*. Falahati *et al.* (2003) in Tehran have not reported any infection in beard by dermatophytes. In present study, *Tinea barbae* was more common in the age range 10-19 with *T. verucosum* as the main agent, whereas in Ahwaz *T. mentagrophytes* had been isolated as the main cause of this Tinea (Mohmoudabadi, 2005).

Tinea pedis was found in 30-39 age range and with an equal rate in the seasons Spring, Autumn and Winter and less common in Summer. Morbidity was 3.5% and the most frequent isolate was *T. rubrum*. Zeini *et al.* (2002) suggested that the prevalence of *Tinea pedis* increases in summers because of more sweating, but present results do not agree to this finding. The rates of this ringworm infection have also been reported by Aghamirian *et al.* (2002) (19%), Falahati *et al.* (2003) (10.6%), Berenji *et al.* (2002) (10.81%), Hashemi *et al.* (2004) (13.3%) and Mahmoodabadi (2005) (16.5%). The last two researches have reported *T. rubrum* as the most common cause of *Tinea pedis*, which is in accordance with present result (Mohmoudabadi, 2005; Aghamirian *et al.*, 2002; Falahati *et al.*, 2003; Pakshir *et al.*, 2001; Hashemi *et al.*, 2004).

Tinea unguinum is widely distributed in human populations. In this study, *Tinea unguinum* had a frequency of 1.2%, equal morbidity in men and women and was caused by *T. rubrum*. In the study of Gupta *et al.* (2007) the most common agents of Onychomycosis were detected *T. rubrum*, *T. mentagrophytes* and *T. verucosum*, respectively. Falahati *et al.* (2003) in Tehran and Berenji *et al.* (2002) in Mashad have reported its frequency to be 2.4 and 17.92%, respectively. In Ahwaz, *Tinea unguinum* prevalence has been reported 13%, more common in men than in women and with *T. mentagrophits* as the most common agent (Mohmoudabadi, 2005; Falahati *et al.*, 2003; Berenji *et al.*, 2002).

As a conclusion in the end, taking into consideration the high prevalence of dermatophytes all over the world and also implicating dermatophytosis as a severe health disaster in human populations, we would like to call up all the mycologists and mycology institutes in the world to suggest WHO to name a specific day as: the day of dermatophytosis.

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