Prevalence of Cutaneous Fungal Infections among Patients Referred to Mycology Laboratory of Toba Clinic in Sari, Iran: A Retrospective Study from 2009 to 2014

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Abstract

Objective: Cutaneous fungal infections are non-invasive infections that manifest in different forms by affecting the skin, hair, or nail. Surveillance for fungal infections is important formaking strategies to assess and to prevent these infections especially in Mazandaran Province; a region with a hot humid climate in northern Iran. This study aimed to investigate the prevalence of cutaneous fungal infections among patients referred to Mycology Laboratory of Toba Clinic in Sari, north of Iran.

Materials & Methods: In this retrospective descriptive analytic study, medical charts of 4,414 patients with cutaneous fungal infections diagnosis who referred to the Mycology Laboratory of Toba Clinic in Sari, Iran during 2009-2014, were selected. Demographic characteristics of the patients were also recorded. Fungal culture was requested for all patients suspected of cutaneous fungal infections. Collected data were analyzed using SPSS software.

Results: Of the total 4,414 cases, 4,309 cases underwent direct and culture examination; 1,567 (36.4%) cases were positive. The rate of fungal infections was significantly different in the two genders ($p<0.001$). The most common sites of fungal infections were on the leg skin in 1,111 (25.7%), face and neck skin in 600 (13.9%), hands in 588 (13.6%) and groin involvement in 526 (12.2%). The most common identified fungal infections were saprophytic infection in 667 cases (42.2%), dermatophytic infection in 631 cases (39.9%) and candidiasis infection in 275 cases (17.4%) respectively. The most common dermatophytosis was Trichophyton mentagrophytes in 336 (21.24%).

Conclusion: This study demonstrates that saprophytic infections were more common than the dermatophytoses in Sari located in Mazandaran province with a hot, humid climate. Tricophyton mentagrophyte is the most common species among dermatophytosis but in the other studies the commonest form were Tricophyton rubrum, Tricophyton verrucosum, Tricophyton violaceum and Epidermophyton floccosum. The differences could be due to differences in climate.

Key words: Prevalence, Fungal infections, Dermatophyte, Candida, Saprophyte, Malassezia

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Introduction

Cutaneous fungal infections (dermatomycosis) are common cutaneous infections that involve the skin and mucosal membranes with various clinical features. Dermatophytes are the most frequent cutaneous fungal infections and accessories of the skin.(1) In recent years, fungal infections have been more prevalent and always invade humans and other animals to produce infection, and can be, in some cases life-threatening.(2) Superficial fungal infections are especially important because the causative agents in most of the cases are normal flora.(1) In decreasing the risk of these causative agents, therapies are not adequate and management and preventive measuremes should be performed.(3, 4) Planning for control of the diseases without epidemiological studies about current prevalence of cutaneous fungal infections is impossible, because epidemiological studies provide adequate data for decision making and selecting the appropriate preventive strategies for controlling the disease and improve the teaching programs to persons at risk of the diseases.

Up to now, more than 40 types of Dermatophytes have been classified in three species; Microsporum, Tricophyton and Epidermophyton.(2) The distribution of Dermatophytes in a geographical area depends on various types of anthropophilic, zoophilic, and geophilic dermatophytes in the region.(4) Nowadays, in varies countries, zoophilic Dermatophytes such as Microsporum canis, Trichophyton mentagrophytes and Trichophyton verrucosum are the main causes of Dermatophyte infections in humans.(3) However, the prevalence of the disease and the causative species of dermatophytosis vary in different areas around the world. In addition, the previous studies in Iran reported a different prevalence of dermatophytosis in various regions in this country.(5-14) The rate of infection depends on several factors such as age, temperature of the environment, amount of humidity, cultural status, and socioeconomic condition of the society.(15)

Fungi grow in warm and humid climates. People, who stay for a long time in warm and humid climates, are at increased risk of fungal infections. Linens, bathroom tiles, and the floor of pools are also favorite places for the growth of fungi.(2) Knowledge about the prevalence and etiologic agents and identification of the prominent species in every region are necessary for accurate and early diagnosis, appropriate treatment and planning of preventive strategies. In spite of several studies performed in different regions of Iran, there is no epidemiological study regarding cutaneous fungal infections in north of Iran, especially in Mazandaran, a northern province with a hot humid climate that is suitable for growth of fungi. For this reason, this study was done to determine the prevalence of cutaneous fungal infections among patients referred to Mycology Laboratory of Toba Clinic in Sari, Iran during 2009-2014.

Methods

In this retrospective descriptive analytic study, medical charts of 4,414 patients with cutaneous fungal infections diagnosis who referred to the Mycology Laboratory of Toba Clinic in Sari, Iran during 2009-2014, were selected. Although, the study was retrospective, in terms of ethical considerations in research, patient's name remained undivulged. Demographic characteristics of the patients including: age on admission, gender, residence, history of certain medicine consumption, positive family history, level of education and occupation derived from the patient's medical charts, were recorded. Fungal culture was requested for all patients who were suspected of cutaneous fungal infections. If the previous culture report existed in the patient's medical record, type of infection and isolated infecting agent from the lesion was recorded in a researcher made questionnaire. Patients with previous history of oral or local anti-fungal medicine consumption were excluded. Patients with history of corticosteroid and immunosuppressive drug consumption were included. Recorded data were analyzed using SPSS software. The t-test was used to compare the mean between the two groups and to compare the mean for more than two groups, ANOVA was used. P-value less than 0.05 was considered significant statistically.

Results

A total of 4,414 medical records of patients diagnosed with cutaneous fungal infection were evaluated. Of those 2,588 (58.63%) were females. The mean age of the patients was 33.2±19.1 years. The mean age of the female patients (34.3±18.1years) was significantly higher than the male patients (31.7±20.4years) ($P<0.001$).

The results of laboratory direct microscopy and culture were available for 4,309 of the patients. Among these, direct microscopy examination and culture was positive in 1,567(36.4%) of the patients (Table 1).

Table 2, shows the rate of contamination based on the site of lesion by sex. The most common site of contamination was leg in 1,111 cases followed by face and neck in 600 cases, hands in 588 cases and groin in 526 cases. In the rate of contamination in all areas there was a significant difference by sex ($P\leq0.001$).

The results of fungi isolated from the specimens obtained from the lesions based on type of isolated fungi by sex are shown in Table 3. The most frequent isolated fungi from the specimen of the lesions was Saprophytes in 667 (42.2%) specimens followed by Dermatophytes in 631(39.9%) and Candida in 275 (17.4%) specimens.

Different types of Dermatophytes and other isolated fungi based on clinical condition of the patients is shown in Table 4 (page 106). Trichophyton mentagrophytes were the most common Dermatophytes in all sites of the lesions.

Table 1. The results of laboratory direct microscopy and culture in the studied population

Results		Culture		Total
		Positive	Negative	
Direct Microscopy Examination	Positive	1461	9	1470
	Negative	106	2733	2839
Total		1567	2742	4309

Table 2. Frequency of Fungal infection based on site of lesion by sex in the studied population

Site of Lesion	Sex		Total
	Male	Female	
Scalp	182 (4.2%)	164 (3.8%)	346 (8%)
Face and Neck	287 (6.64%)	313 (7.24%)	600 (13.9%)
Trunk	144 (3.3%)	274 (6.3%)	418 (9.7%)
Hands	223 (5.2%)	365 (8.4%)	588 (13.6%)
Foot	461 (10.7%)	650 (15.02%)	1111 (25.7%)
Hand Nail	105 (2.4%)	296 (6.8%)	401 (9.3%)
Foot Nail	106 (2.5%)	229 (5.3%)	335 (7.8%)
Groin	277 (6.4%)	249 (5.8%)	526 (12.2%)
Total	1785 (41.3%)	2540 (58.7%)	4325 (100%)

Table 3. Frequency of fungi isolated from the patients specimen based on type of fungi by sex

Type of fungi	Species	Sex		Total
		Male	Female	
Dermatophytes	Epidermophyton floccosum	40 (2.5%)	60 (3.9%)	631 (39.9%)
	Trichophyton tonsurans	37 (2.34%)	58 (3.66%)	
	Trichophyton rubrum	40 (2.5%)	59 (3.7%)	
	Trichophyton mentagrophytes	146 (9.24%)	190 (12%)	
	Microsporum	1 (0.06%)	0	
Saprophytes	unknown (due to not clinically significant)	239 (15.12%)	352 (22.23%)	667 (42.2%)
	Cladosporium	0	3 (0.19%)	
	Rhizopus	2 (0.13%)	1 (0.06%)	
	Aspergillus	3 (0.19%)	8 (0.51%)	
	Aspergillus niger	8	6 (0.39%)	
	Alternaria	3 (o.19%)	1 (0.06%)	
	Penicillium	0	3 (0.19%)	
	Aspergillus flavus	12 (0.76%)	20 (1.3%)	
	Fusarium	1 (0.06%)	4 (0.25%)	
	Achremonium	0	1 (0.06%)	
Malassezia	Malassezia	4 (0.25%)	5 (0.31%)	9 (0.6%)
Candida	Candida	104 (6.6%)	171 (10.8%)	275 (17.4%)
Total		640 (40.5%)	942 (59.5%)	1582 (100%)

Table 4: Different type of Dermatophytes and other isolated fungi based on clinical condition of the studied population

Type of fungi		Site of lesion								Total
		Scalp	Face & Neck	Trunk	Hands	Foot	Hand Nail	Foot Nail	Groin	
Dermatophytes	Epidermophyton floccosum	7 (0.45%)	10 (0.65%)	11 (0.71%)	15 (0.97)	25 (1.6%)	9 (0.58%)	4 (0.26%)	18 (1.16%)	620 (40.1%)
	Trichophyton tonsurans	4 (2.26%)	17 (1.10%)	9 (0.58%)	13 (0.84%)	28 (1.8%)	9 (0.58%)	6 (0.4%)	12 (0.8%)	
	Trichophyton rubrum	35 (2.25%)	41 (2.66%)	35 (2.25%)	45 (2.91%)	28 (1.8%)	28 (1.8%)	23 (1.5%)	36 (2.3%)	
	Trichophyton mentagrophytes	0	1 (0.065%)	0	0	0	0	0	0	
	Microsporum	7 (0.45%)	15 (0.97%)	7 (0.45%)	16 (1.01%)	24 (1.555%)	8 (0.52%)	6 (0.4%)	11 (0.71%)	
Saprophytes	unknown (due to not clinically significant)	37 (2.38%)	90 (5.83%)	59 (3.8$)	74 (4.8%)	146 (9.4%)	63 (4.1%)	36 (2.3%)	73 (4.7%)	651 (42.1%)
	Cladosporium	2 (0.13%)	0	1 (0.06%)	0	0	0	0	0	
	Rhizopus	0	1 (0.065%)	0	1 (0.65%)	0	0	0	1 (0.07%)	
	Aspergillus	2 (0.13%)	1 (0.065%)	2 (0.13%)	1 (0.65%)	1 (0.065%)	1 (0.06%)	1 (0.07%)	2 (0.13%)	
	Aspergillus niger	0	5 (0.32%)	2 (0.13%)	2 (0.13%)	2 (0.13%)	1 (0.06%)	0	1 (0.07%)	
	Alternaria	1 (0.064%)	0	0	0	2 (0.13%)	0	1 (0.07%)	0	
	Penicillium	0	2 (0.13%)	0	0	0	0	0	0	
	Aspergillus flavus	1 (0.064%0	5	3 (0.19%)	6 (0.39%)	6 (0.39%)	2 (0.13%)	3 (0.19%)	5 (0.32%)	
	Fusarium	0	2 (0.13%)	0	2 (0.13%)	1 (0.065%)	0	0	0	
	Achremonium	0	0	1 (0.06%)	0	0	0	0	0	
Malassezia	Malassezia	2 (0.13%)	2 (0.13%)	1 (0.06%)	0	3 (0.19%)	0	0	1 (0.07%)	9 (0.58%
Candida	Candida	20 (1.29%)	35 (2.27%)	23 (1.5%)	45 (2.9%)	66 (4.26%)	28 (1.8%)	22 (1.4%)	29 (1.9%)	268 (17.3%)
Total		118 (7.6%)	227 (14.7%)	154 (9.9%)	220 (14.2%)	389 (25.1%)	149 (9.6%)	102 (6.6%)	189 (12.2%)	1548 (100%)

Discussion

In the present study, from a total of 4,414 patients, 4,325 cases were infected. Direct microscopy examination and culture was done for 4,309 cases. Of these, 1,582 cases had fungal infection; 631 (39.88%) had dermatophytes infection, 667 (42.16% had saprophytes infection, 9 (0.56%) had Malassezia infection and 275 (17.38%) had candida infection. saprophytes infection was the most common infection. Trichophyton mentagrophytes (336 cases) was the most common dermatophyte infection followed by Epidermophyton floccosum, Trichophyton rubrum, Trichophyton tonsurans and Trichophyton Microsporum. In contrast, Nikpour et al in Shiraz/Iran, reported Trichophyton rubrum was the most common dermatophyte infection followed by Trichophyton mentagrophytes, Trichophyton schoenleinii.(5)

Shadeganipour et al in Isfahan/Iran performed a study on 12,000 dermatologic patients. They found that the prevalence of dermatophyte infection was 10.8T and Tinea capitis (72.1%) and Trichophyton verrucosum were the most common dermatophyte respectively.(6) Although their sample size was three times of ours, the result of our study showed that the prevalence of dermatophyte infection was 14.04% which was relatively similar to their results. Ten years later, Shadegani et al performed another study in Isfahan, Iran on 57,816 dermatologic patients. They reported the prevalence of dermatophyte infection was 13.3% which confirmed our result. They reported Tinea capitis (54.1%) was the most common fungal infection followed by Tinea Pedis (23.8%) and Tinea corporalis (8.9%) respectively.(7) They reported Trichophyton verrucosum (32.8%) was the most common dermatophyte isolated from the scalp, whereas, our study showed that Trichophyton mentagrophytes (5.64%) was the most common dermatophyte isolate in patients with Tinea capitis. The most common sites of fungal infections in the present study were feet (25.12%), face and neck (14.66%) and hands (14.21%) respectively.(7)

Omidynia et al. performed a study from October 1991 to June 1992 in the Hamadan province of West Iran to determine the extent and causative agents of dermatophytoses. Of 7,495 individuals, 681 (9%) were suspected of having cutaneous mycoses. From those, 259 individuals were infected with dermatophytes. Tinea capitis was observed in 62.9%, and Tinea corporis in 10.4%. Tinea was the most common type of dermatophyte. The most common isolated species reported by them were Trichophyton verrucosum, 78 (54.1%) and Trichophyton schoenleinii, 48 (33.3%), while, from 4,414 cases in our study, 620 (14.04%) cases had dermatophyte infection; of these, 8.54% involved Tinea capitis. Among the whole fungal infection in our study, 118 (2.67%) cases had Tinea capitis and 32.39% had fungal infection on the other sites of their body.(8)

In Falahati et al's study, epidemiology of dermatophytoses in an area south of Tehran, Iran was investigated. They found that the prevalence of dermatophytoses was 13.5%. They revealed that Epiderophyton floccosum was the most frequent dermatophyte isolated (31.4%) followed by Trichophyton rubrum (18.3%). The frequency of all of types of Tinea was higher in males than in females.(9) Dissimilarly, in our study, involvement of females to all types of Tinea was higher than males.

In Lari et al.'s study, characteristics of dermatophytoses in 382 children under 16 years in an area south of Tehran, Iran was investigated. They found Trichophyton violaceum was the most frequent isolate (28.3%) followed by Microsporum canis (15.1%), Epidermophyton floccosum (15.1%), Trichophyton rubrum (13.2%), Trichophyton mentagrophytes (11.3%), M. gypseum (7.5%), and Trichophyton verrucosum (5.7%). Tinea capitis (39.6%) was the most common type of infection, followed by Tinea corporis (30.2%).(10) In our study, most of the patients were older than 16 years and the mean age of females and males were 34.3±18.1 and 31.7±20.4 respectively (P≤0.001). In a study by Aghamirian and Ghiasian during 2004-2006 in Qazvin, the prevalence and etiological agents of dermatophytoses was assessed in 1,023 subjects suspected to cutaneous mycoses. Dermatophytoses were identified in 348 (34%) patients. They revealed that Epidermophyton floccosum was the most frequently isolated species in 32.8% of isolates, followed by Trichophyton rubrum (18.1%), and Trichophyton verrucosum (17.2%). Tinea cruris (31.9%) was the most common type of infection that affected particularly male patients. Tinea corporis and Tinea pedis were observed in 20.7% and 19% of their patients (11). In our study, the prevalence of Epidermophyton floccosum, Trichophyton rubrum and Trichophyton tonsurans were 2.24%, 2.22% and 2.12% respectively which was different from results reported by them.

In a study performed by Khosravi et al., during 1986-1991 about Dermatophytoses in Iran, 12,150 cases were evaluated. Of those, clinical diagnosis was confirmed in only 9,345 cases by laboratory examination. From 9,345 positive samples, 1,633 cases were positive only by direct microscopic observation and 429 only by culture and 7,283 by both techniques. Tinea corporis and Tinea cruris were the most common dermatophytoses respectively.(12) Although, our study was performed during a 5 year period, from a total of 4,414cases, 4,309 cases had direct examination and culture and the most sites of infection were foot followed by face and neck, hands and groins, which was different to their results.

Edalatkha et al., evaluated the prevalence of various species of Dermatophytes in 15,498 patients referring to the Dermatology Clinic of Tabriz Haft-e-Tir Hospital. Only 1,562 (10%) were suspected to have fungal infection and only 559 cases had positive culture. The prevalence of Trichophytosis was 91.4%. Tinea capitis and Tinea corporis were the most common clinical form of the disease. Trichophyton verrucosom, and then Trichophyton schoenleinii, Microsporum canis and candidasis were the most infecting agents. Their results were different from ours.(13)

Tabatabai et al., studied the epidemiological and other contributing factors on the establishment of fungal infections among patients referred to Rasul-e Akram Hospital in Tehran. Direct examination and culture was performed on 500 patients suspected of fungal infections. They identified a total of 253 fungi which included 51.4% dermatophytes, 20.1% Erythrasma, 18.6% candidiasis, 8.3% pityriasis versicolor and 1.6% nail Aspergillus. In the present study, we found no Erythrasma infection, and Malassezia infection, which in their study was 8.3%, whereas we reported it in 0.2% of our patients. The cause of difference was because of the accurate diagnosis of Malassezia infections in clinical examination and less need to send the suspected samples to the laboratory. Also, nail infection in our study was 0.18%. (14)

Conclusion

It seems that the main cause of different results in our study is related to the Mycology Laboratory of Toba Clinic in Sari, Iran as a referral laboratory in Mazandaran Province and this center receives samples from all specialists in medical fields. On the other hand, because dermatologists are more expert in reporting the suspected cases of fungal infections, the significant differences may be due to the role of dermatologists where most of the patients are referred to the reference Mycology Laboratory. Preparing electronic sources for data gathering is recommended, because most of the data reported after 2009 were recorded manually. The causes of higher prevalence of fungal infection among females than males may be due to more referring of females to this center.

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