

## A retrospective study of cutaneous fungal infections in patients referred to Imam Reza Hospital of Mashhad, Iran during 2000-2011

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### Abstract

**Background and Purpose:** Detection of agents responsible for cutaneous mycosis may be effective in the prevention of fungal infections from environmental and animal sources. With this background in mind, in this study, we aimed to identify the distribution of cutaneous mycotic infections in patients referred to Imam Reza Hospital of Mashhad, Iran during 2000- 2011.

**Materials and Methods:** In total, 8694 patients suspected of superficial and cutaneous mycosis, referred to the Medical Mycology Laboratory of Imam Reza Hospital of Mashhad, Iran, were recruited during March 2000-2011 and were examined in terms of fungal infections.

**Results:** Of 8694 suspected patients, 3804 (43.75%) cases suffered from superficial and cutaneous mycosis. In total, 1936 (50.9%) patients were male, and 1868 (49.1%) were female. *Malassezia* infections (58.1%), dermatophytosis (33.1%), cutaneous candidiasis (6.8%), aspergillosis (1.6%), and saprophytic cutaneous mycosis (0.4%) were the most common infections.

**Conclusion:** In this study, *Malassezia* infections were the most common superficial and cutaneous mycoses. Therefore, it seems essential to focus on the prevention of these infections in our society.

**Keywords:** Epidemiology, Fungal infection, Iran

#### ► How to cite this paper:

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### Introduction

Epidemiological studies mostly focus on the development of acceptable strategies to prevent the incidence of diseases. Knowledge of epidemiological and mycological characteristics is important for the management of these infections [1]. Superficial and cutaneous fungal infections may be caused by dermatophytes, yeasts, and non-dermatophyte molds [1-6].

The characteristics and prevalence of dermatophytes, which are influenced by several factors such as climatic variations, socioeconomic factors, age, lifestyle, hygiene, and presence of pets, may vary from one region to another over time [2, 7, 8]. Dermatophytosis and other superficial and cutaneous fungal infections are still regarded as a major health concern in many parts of the world [9, 10]. Therefore, it is important to provide epidemiological data to enable strategic planning and disease eradication for diagnostic and

therapeutic purposes [6, 7, 11].

The Parasitology and Mycology Laboratory of Imam Reza Hospital of Mashhad is one of the main mycology laboratories in northeast of Iran [South Khorasan, North Khorasan, and Razavi Khorasan]. In this study, we aimed to determine the distribution of cutaneous mycosis in Mashhad, Iran over 10 years.

### Materials and Methods

The present study is a retrospective, cross-sectional research. The review of statistical records over the past 10 years [2000-2011], available at the Parasitology and Mycology Laboratory of Imam Reza Hospital, provided the demographic information of patients suspected of skin fungal infections. The specimens were obtained from clinically abnormal skin lesions and hair or nail samples of suspected patients through scraping.

Fresh smears with 10% potassium hydroxide [KOH] were prepared and examined directly under a light microscope.

The collected information included sex, age, place of residence [i.e., urban and rural areas based on the patient's living geographical condition], type of infection, and lesion site. The epidemiological data were recorded in laboratory checklists. The collected data were analyzed, using SPSS version 16. Chi-square test was used to compare the obtained data. P-value less than 0.05 was considered statistically significant.

## Results

Of 8694 cutaneous and superficial fungal infections in the suspected patients, referred to the Mycology and Parasitology Laboratory of Imam Reza Hospital, 3804 [43.75%] patients were found to have superficial and cutaneous fungal infections. In a total of 3944 patients, 1936 [50.9%] were male and 1868 [49.1%] were female; the difference was statistically significant [ $P < 0.001$ ]. The majority of patients were within the age range of 20-29 years [35.5%], and the lowest prevalence of infections was reported in the age range of 1-9 years [7.5%]. Overall, 88.5% of the patients resided in urban areas.

A total of 2212 [58.1%] cases were positive for *Malassezia* infections; therefore, they were recognized as the most frequent type of infection. Furthermore, 1257 [33.1%] cases of dermatophytosis, 258 [6.8%] cases of cutaneous candidiasis, 62 [1.6%] cases of *Aspergillus* dermatomycosis, and 15 [0.4%] cases of dermatomycosis due to other opportunistic fungi except *Aspergillus* were identified (Table 1).

The most commonly affected region in dermatophytic lesions was the scalp [17.3%], while the least affected site was the axillary region [0.4%]. Also, in *Malassezia* infections, the most commonly affected region was the scalp [58.4%], while the least commonly affected region was the hand [0.7%]. Among *Candida* lesions, the most commonly affected regions were the nails [68.6%], whereas the least commonly affected site was the axillary region [0.8%]. The prevalence of onychomycosis caused by *Candida* species was 133 (75%) in women and 44(25%) in men. Distribution of fungal infections according to lesion localization is presented in Table 2.

## Discussion

Superficial and cutaneous fungal infections are among the most widespread groups of mycoses.

The prevalence of superficial mycotic infections has increased over the past decades. Cutaneous fungal infections are categorized as the most frequent infections, affecting more than 20–25% of the world's population [10]. The aim of the present study was to describe the epidemiological aspect of cutaneous fungal infections among 8694 patients suspected of superficial and cutaneous mycoses, referring to the Mycology and Parasitology Laboratory of Imam Reza Hospital of Mashhad from March 2000 to March 2011.

In the present study, the prevalence of cutaneous and superficial fungal infections were higher in men. In a previous study in Mashhad, Iran [2013], Naseri et al. reported the higher prevalence of dermatophytosis in males in comparison with females [12]. In addition, Fata et al. evaluated the prevalence of mycotic diseases in medical students. The results revealed that the prevalence of cutaneous mycotic infections was higher in male students in comparison with females in Mashhad, Iran [13].

In studies by Bassiri-Jahromi et al., Sberna F et al., and similar research, male patients were more affected by fungal infections than females [14-17]. On the other hand, several studies have indicated the higher incidence of cutaneous and superficial fungal infections in women compared to men [3, 16]. In this study the lowest prevalence of infections was reported among patients within the age range of 1-9 years [7.5%]. In addition, according to a study by Ngwogu AC et al. in Eastern Nigeria, the highest prevalence [39%] of infection was observed among males aged 10-12 years, while the lowest prevalence was observed among females aged 16-18 years [2.5%] [17].

In the present study, among 3804 patients with

**Table 1.** Distribution of fungal infections according to sex in patients referred to the Parasitology and Mycology Laboratory of Imam Reza Hospital, Mashhad over 10 years (2000-2011)

Type of infection	Sex	
	Female Number (%)	Male Number(%)
Dermatophytosis	530 (28.4)	727 (37.6)
<i>Malassezia</i> infections	1104 ( 59.1)	1108 (57.2)
Cutaneous candidiasis	179 (9.6)	79 (4.1)
<i>Aspergillus</i> dermatomycosis	48 (2.6)	14 (0.7)
Dermatomycosis due to other opportunistic fungi	7 (0.4)	8 (0.4)
Total (%)	1868 (49.1)	1936 (50.9)
P-value	<0.001	

**Table 2.** Distribution of fungal infections according to the localization of the involved area in patients referred to the Parasitology and Mycology Laboratory of Imam Reza Hospital, Mashhad over 10 years (2000-2011)

Type of infection	Chest and back	Axillary region	Groin	Nail	Hand	Foot	Beard	Scalp	Others	Total
	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)
<b>Dermatophytosis</b>	56(4.5%)	5(0.4%)	214 (17%)	67 (5.3%)	126 (10%)	213 (17%)	23 (1.8%)	217 (17.3%)	336 (26.7%)	1257 (100%)
<b><i>Malassezia</i> infections</b>	239(10.8%)	20 (0.9%)	104 (4.7%)	22 (1%)	15 (0.7%)	31 (1.4%)	20 (0.9%)	1292 (58.4%)	469 (21.2%)	2212 (100%)
<b>Cutaneous candidiasis</b>	6 (2.3%)	2 (0.8%)	18 (7%)	177 (68.6%)	12 (4.5%)	23 (9.1%)	-	3 (1.2%)	17 (6.6%)	258 (100%)
<b><i>Aspergillus</i> dermatomycosis</b>	-	-	2 (3.2%)	55 (88.7%)	1(1.6%)	1(1.6%)	-	-	3 (4.8%)	62 (100%)
<b>Dermatomycosis due to other opportunistic fungi</b>	-	-	-	13 (86.7%)	1 (6.6%)	1 (6.5%)	-	-	-	15 (100%)

cutaneous and superficial fungal infections, 2212 [58.1%] were positive for *Malassezia* infections; therefore, this type of infection was introduced as the most frequent infection. The most commonly affected region in *Malassezia* infections was the scalp [58.4%]. Furthermore, 1257 [33.1%] cases of dermatophytes, 258 [6.8%] cases of *Candida* infections, 62 [1.6%] cases of aspergillosis, and 15 [0.4%] cases of other fungal infections were identified.

Yeasts of the genus *Malassezia* belong to the normal microflora of the human skin and are associated with a variety of skin diseases, such as seborrheic dermatitis, dandruff, *Malassezia* folliculitis, and atopic dermatitis of the head and neck regions [18-20]. Also, Miklic et al. identified the frequency of superficial mycosis based on the etiological agents isolated over 10 years [1999-2008] in Zagreb, Croatia. The results showed that dermatophytes were responsible for 63% of all superficial fungal diseases, followed by yeasts [36%] and molds [1%] [3].

According to the present study, the prevalence of onychomycosis caused by *Candida* species was 75% and 25% in women and men, respectively. The higher incidence of candidal onychomycosis in women could be justified by the subjects' constant contact with water in kitchen. Moreover, Di Chiacchio et al. described the epidemiological profile of onychomycosis in Brazil between May and July 2010 and showed that onychomycosis was more prevalent among physically active women and those with a prior history of the disease [21].

Kemna and Elewski performed an epidemiological survey of superficial fungal diseases in the United States showed that *Candida albicans* and non-dermatophyte molds played only a minor role in onychomycosis. *C. albicans*

was isolated in 7% of nail cultures and non-dermatophytic molds were isolated in 11% of the cultures [22].

Overall, the prevalence of superficial and cutaneous fungal infections has globally increased over the past years, making these fungal infections the most commonly encountered infections. In general, the etiological pathogens and major infection sites vary depending on the geographical region and environmental factors [7].

## Conclusion

In the present study, among 8694 patients suspected of superficial and cutaneous mycosis, who were referred to the Parasitology and Mycology Laboratory of Imam Reza Hospital of Mashhad, 3804 cases had cutaneous fungal infections. The results showed the high prevalence of these infections in our society. Therefore, clinicians should consider fungal infections in the differential diagnosis of patients with skin lesions. Based on the findings, *Malassezia* infections were the most common superficial and cutaneous mycotic infections. Therefore, it seems necessary to focus on the prevention and control of such infections.

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## Author's contribution

F.B. designed and managed the study. M.G. performed the specimen collection and practical

experiments. Collecting data was performed by M.M.S. The primary draft of the manuscript was prepared by M.M.S, Z.A.A. and F.S. Statistical analysis of data was performed by M.S and F.S. The Final revision of manuscript was done by F.B.

### Conflicts of interest

The authors declare no conflicts of interest.

### Financial disclosure

There was no financial interest related to the materials of the manuscript.

### References

1. Bassiri-Jahromi S, Khaksari AA. Epidemiological survey of dermatophytosis in Tehran, Iran, from 2000 to 2005. *Indian J Dermatol Venereol Leprol.* 2009; 75(2):142-7.
2. Di Chiacchio N, Madeira CL, Humaire CR, Silva CS, Fernandes LH, Dos Reis AL. Superficial mycoses at the Hospital do Servidor Público Municipal de São Paulo between 2005 and 2011. *An Bras Dermatol.* 2014; 89(1):67-71.
3. Miklič P, Skerlev M, Budimčić D, Lipozenčić J. The frequency of superficial mycoses according to agents isolated during a ten-year period (1999-2008) in Zagreb area, Croatia. *Acta Dermatovenerol Croat.* 2010; 18(2):92-8.
4. Pagano L, Caira M, Candoni A, Offidani M, Fianchi L, Martino B, et al. The epidemiology of fungal infections in patients with hematologic malignancies: the SEIFEM-2004 study. *Haematologica.* 2006; 91(8):1068-75.
5. Smith JD, BC-ADM CD. Cutaneous fungal infections. *US Pharm.* 2015; 40(4):35-9.
6. Tan HH. Superficial fungal infections seen at the National Skin Centre, Singapore. *Nihon Ishinkin Gakkai Zasshi.* 2005; 46(2):77-80.
7. Zarrin M, Poosashkan M, Mahmoudabadi A, Mapar M. Prevalence of superficial fungal infection in primary School Children in Ahvaz, Iran. *Maced J Med Sci.* 2011; 4(1):89-92.
8. Piérard G. Onychomycosis and other superficial fungal infections of the foot in the elderly: a pan-European survey. *Dermatology.* 2001; 202(3):220-4.
9. Pakshir K, Hashemi J. Dermatophytosis in Karaj, Iran. *Indian J Dermatol.* 2006; 51(4):262.
10. Havlickova B, Czaika VA, Friedrich M. Epidemiological trends in skin mycoses worldwide. *Mycoses.* 2008; 51(Suppl 4):2-15.
11. Ameen M. Epidemiology of superficial fungal infections. *Clin Dermatol.* 2010; 28(2):197-201.
12. Naseri A, Fata A, Najafzadeh MJ, Shokri H. Surveillance of dermatophytosis in northeast of Iran (Mashhad) and review of published studies. *Mycopathologia.* 2013; 176(3-4):247-53.
13. Fata A, Jahanian M, Rakhshandeh H. Study the prevalence of cutaneous mycotic diseases among students of Mashhad university of Medical Sciences. *Med J Mashhad Univ Med Sci.* 1999; 42(64):23-32.
14. Bassiri-Jahromi S. Epidemiological trends in zoophilic and geophilic fungi in Iran. *Clin Expe Dermatol.* 2013; 38(1):13-9.
15. Sberna F, Farella V, Geti V, Taviti F, Agostini G, Vannini P, et al. Epidemiology of the dermatophytoses in the Florence area of Italy: 1985-1990. Trichophyton mentagrophytes, Epidermophyton floccosum and Microsporum gypseum infections. *Mycopathologia.* 1993; 122(3):153-62.
16. Edalatkhah H, Golfroshan F, Azimi H, Mohammadi P, Razi A. Prevalence of various species of dermatophytes in patients referring to the dermatology clinic of Tabriz Haft-e-Tir Hospital. *J Ardabil Univ Med Sci.* 2006; 6(1):47-52.
17. Ngwogu AC, Otokunefor TV. Epidemiology of dermatophytoses in a rural community in Eastern Nigeria and review of literature from Africa. *Mycopathologia.* 2007; 164(4):149-58.
18. Hort W, Nilles M, Mayser P. Malassezia yeasts and their significance in dermatology. *Hautarzt.* 2006; 57(7):633-43.
19. Rahbar M, Mehrabani HG, Dahiml P, Molanei S, Roodaki MM. Prevalence and etiological agents of cutaneous fungal infections in Milad Hospital of Tehran, Iran. *Egypt Dermatol Online J.* 2010; 6(2):3.
20. Khosravi AR, Aghamirian MR, Mahmoudi M. Dermatophytoses in Iran. *Mycoses.* 1994; 37(1-2):43-8.
21. Di Chiacchio N, Suarez MV, Madeira CL, Loureiro WR. An observational and descriptive study of the epidemiology of and therapeutic approach to onychomycosis in dermatology offices in Brazil. *An Bras Dermatol.* 2013; 88(Suppl 1):3-11.
22. Kemna ME, Elewski BE. A US epidemiologic survey of superficial fungal diseases. *J Am Acad Dermatol.* 1996; 35(4):539-42.