

A study on etiologic agents and clinical manifestations of dermatophytosis in Yazd, Iran

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Abstract

Background and Purpose: Dermatophytosis is one of the most common infections of skin, hair, and nails, caused by a group of keratinophilic fungi known as dermatophytes. Species identification of these fungi is of great significance from epidemiological and therapeutic points of view. The objective of the present study was to investigate dermatophytosis and its causative agents in patients, referring to the Central Mycology Laboratory of Yazd University of Medical Sciences, Yazd, Iran.

Materials and Methods: In total, 139 clinically suspected cases of dermatophytosis were examined during 12 months from February 2014 to February 2015. Skin scrapings were assessed through direct microscopic examinations and culture studies. Dermatophyte isolates were identified based on colony morphology on potato dextrose agar and dermatophyte test medium, nutritional requirements, urease and hair perforation tests, and microscopic characteristics on slide cultures.

Results: Dermatophytosis was mycologically confirmed in 26 (18.70%) out of 139 cases. Although there was a statistically insignificant difference between male and female subjects, men were dominantly affected. Infection was significantly common in the age group of ≤ 29 years ($P < 0.043$). The most common clinical manifestation of dermatophytosis was tinea corporis (69.2%), followed by tinea cruris (15.4%), tinea manuum (11.5%), and tinea pedis (3.8%). *Trichophyton mentagrophytes* complex was the main etiologic agent (38.5%), followed by *T. rubrum* (23%), *T. violaceum* (15.5%), *T. verrucosum* (11.5%), *Microsporum canis* (7.7%), and *Epidermophyton floccosum* (3.8%).

Conclusion: In comparison with previous research, epidemiology of dermatophytosis has changed in Yazd over the past decades. Therefore, periodical investigations on the epidemiological aspects of this infection are required for efficient control and prevention of this cutaneous dermatophytic disease.

Keywords: Epidemiology, *Epidermophyton*, Iran, *Microsporum*, Tinea, *Trichophyton*

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Introduction

Dermatophytes by involving the skin, hair, and nails can cause dermatophytosis [1]. Classically, tinea is categorized into eight major types, i.e., tinea corporis, tinea cruris, tinea pedis, tinea manuum, tinea faciei, tinea barbae, tinea capitis, and tinea unguium [2, 3]. Tinea capitis is a common condition in children [4], whereas tinea cruris is predominant in male adults [5]. Of these major types, tinea unguium is usually regarded as a chronic infection of nails in adults [6].

Dermatophytes are divided into three distinct anthropophilic, zoophilic, and geophilic groups. Human infection may be caused by the members of these three groups. Three genera of

dermatophytes including *Epidermophyton*, *Trichophyton*, and *Microsporum* with nearly 40 species have been identified [2]. The prevalence of dermatophytes varies in different geographical regions [1,7-18]. In Iran, epidemiology of dermatophytosis has changed over the past decades [19]. In fact, in several studies in Iran, predominance of zoophilic dermatophytes over anthropophilic fungi has been reported in some regions [20, 21].

In the present study, we aimed to determine the current status of dermatophytosis, based on demographic data, clinical manifestations, and etiologic agents in patients, referring to the

Central Mycology Laboratory of Yazd University of Medical Sciences, Yazd, Iran.

Material and Methods

Study population

In total, 139 patients (70 males and 69 females) with a clinical suspicion of dermatophytosis were studied during 12 months from February 2014 to February 2015 in the Central Mycology Laboratory of Yazd University of Medical Sciences, Yazd, Iran. The age range of subjects was 1-72 years. Informed consent forms were obtained from all adults, children's parents, or their guardians.

Mycological examination

Considering the localization and characterization of lesions, skin scrapings were obtained and assessed through direct microscopic examination and culture studies. Direct microscopic examination with 10% potassium hydroxide (KOH) was performed on a section of each specimen to determine the presence of hyphae and arthrospores. The remaining samples were cultured on Sabouraud dextrose agar (Merck, Darmstadt, Germany) with or without cycloheximide.

The slants were incubated at 28°C for one to four weeks. The cultures were checked twice weekly for evidence of colony growth. According to basic mycological techniques, all isolates were identified by determining the macroscopic colony characteristics and microscopic features of slide cultures on potato dextrose agar (Merck, Darmstadt, Germany). Differential diagnostic methods such as pigment production, hair perforation test, nutritional requirements, and urease test were also performed if needed [22].

Table 2. Frequency and distribution of the isolated dermatophyte species according to clinical manifestations

Clinical forms	Etiologic agents													
	<i>T. mentagrophytes</i>		<i>T. rubrum</i>		<i>T. violaceum</i>		<i>T. verrucosum</i>		<i>E. floccosum</i>		<i>M. canis</i>		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Tinea corporis	6	33.3	4	22.2	4	22.2	3	16.8	0	0	1	5.6	18	100
Tinea cruris	1	25	1	25	0	0	0	0	1	25	1	25	4	100
Tinea manuum	2	66.6	1	33.4	0	0	0	0	0	0	0	0	3	100
Tinea pedis	1	100	0	0	0	0	0	0	0	0	0	0	1	100
Total	10	38.5	6	23	4	15.4	3	11.5	1	3.8	2	7.7	26	100

T: *Trichophyton*, E: *Epidermophyton*, M: *Microsporum*, N: Number

Statistical analysis

Statistical analysis was performed, using SPSS version 20. Categorical variables were compared with universal standards, using Fisher's exact test. The statistical confidence level was set at 95% and *P*-value less than 0.05 was considered statistically significant.

Results

Among 139 examined patients, 26 (18.7%) cases were found to have dermatophytosis. Infection was confirmed by both microscopic examination and culture studies. The affected patients included 12 females and 14 males within the age range of 1-72 years. Dermatophytosis was significantly more common in the age group of ≤ 29 years. Further information is presented in Table 1.

Tinea corporis (69.2%) was the predominant clinical manifestation, followed by *tinea cruris* (15.4%), *tinea manuum* (11.5%), and *tinea pedis* (3.8%). Despite the higher frequency of *tinea corporis* and *tinea cruris* in male subjects and *tinea manuum* and *tinea pedis* in females, the difference in

Table 1. Distribution of the study population based on the age and the results of mycological examinations

Age groups (years)	Dermatophytosis				Total	
	Positive		Negative		N	%
	N	%	N	%		
≤ 29	15	18.1	68	81.9	83	100
30-59	7	14.2	42	85.8	49	100
≥ 60	4	57.1	3	42.9	7	100
Total	26	18.7	113	81.3	139	100

N: Number

Table 3. Distribution of the study population, based on the occupational status and the results of mycological examinations

Occupational status	Dermatophytosis				Total	
	Positive		Negative			
	N	%	N	%	N	%
Self-employed	3	12.5	21	87.5	24	100
Student	2	50	2	50	4	100
University student	2	11.8	15	88.2	17	100
Housewife	10	26.3	28	73.7	38	100
Employee	1	8.4	11	91.6	12	100
Worker	0	0	8	100	8	100
Retired	0	0	5	100	5	100
Total	18	16.7	90	83.3	108	100

infection rate between the genders was statistically insignificant ($P=0.828$).

The etiologic agents in 26 positive cases were identified as *Trichophyton mentagrophytes* (38.5%), *T. rubrum* (23%), *T. violaceum* (15.4%), *T. verrucosum* (11.5%), *Microsporium canis* (7.7%), and *Epidermophyton floccosum* (3.8%). The clinical presentations and causative agents of positive cases are summarized in Table 2.

Fisher's exact test was performed to determine the correlation between dermatophytosis and gender, age, genus/species of organisms, and patients' occupational status. Based on the findings, patients ≤ 29 years of age were more affected by dermatophytosis, and a significant correlation was observed between dermatophytosis and age ($P=0.043$).

As the findings indicated, dermatophytosis was not significantly correlated with patients' gender or genus/species of the organism ($P=0.828$ and 0.761 , respectively). Despite the higher incidence of dermatophytosis among housewives and self-employed subjects (Table 3), Fisher's exact test did not reveal a significant relationship between occupational status and dermatophyte infection ($P=0.394$).

Discussion

Dermatophytosis is a common fungal infection in humans and animals. This infection has a global distribution and is regarded as a public health concern. Generally, individuals from all age groups may present with dermatophytosis, although young adults of both genders are more commonly affected. The

frequency of this infection varies, depending on the site of infection, the immunological response of the host, and species of the causal agent. Also, many other factors such as migration patterns, frequent travelling, and lifestyle may affect the epidemiology of dermatophytic infection [23].

In our investigation, male subjects were more commonly affected by dermatophytosis, compared to females; in fact, males were affected 1.16 times more than females in our research. Infection was mainly reported in the age group of ≤ 29 years, which was in agreement with the results of previous studies in Iran [4, 12, 24-28]. Similar to a previous investigation in Yazd, the present study introduced tinea corporis (69.2%) as the predominant form of infection. This finding was in line with several studies [25, 28-30] and in contrast with the results of several articles in different parts of Iran [12, 24, 26, 31].

According to a study by Hashemi et al., tinea corporis was the most frequent form of dermatophytosis in Arak, Iran [27]. In congruence with previous research in Iran, *T. mentagrophytes*, *T. rubrum*, and *T. violaceum* were the main causes of tinea corporis in the present study [9, 20, 27, 32-34]. Interestingly, this finding was in contrast with previous reports from Yazd, which introduced *T. verrucosum* as the most common agent, followed by *E. floccosum* and *T. violaseum*. [34]; this indicates a shift in causative agents of dermatophytosis in Yazd, Iran.

According to the present study, tinea cruris (15.4%) was the second most common

clinical presentation. Even though this finding was in accordance with some previous reports from Iran [25, 35], it was in contrast with previous studies in Yazd [34], Kerman [24], Isfahan [20], Hamadan [30], Tehran [31, 36], Rasht [11], and Gorgan [37], in which tinea cruris was the most common type of dermatophytosis.

E. floccosum, *T. mentagrophytes*, *T. rubrum*, and *M. canis* were the etiologic agents of tinea cruris in the present study. In our investigation, tinea cruris was more frequent in males, as reported by previous researches in Yazd and other parts of Iran [5, 13, 34]. However, unlike a study by Mosavi et al. [24] in Kerman, which reported tinea manuum as the main form of dermatophytosis, in the present study, tinea manuum was ranked third in terms of frequency. Although this finding was supported by some previous studies [34-36], it was in contrast with other reports from Iran [20, 25, 26, 34].

Higher frequency of tinea manuum in females was reported in the present study, as well as previous research. Also, *T. mentagrophytes*, followed by *T. rubrum*, was the most common cause of disease in our research, similar to several previous studies [9, 24, 29, 36]. Contrary to previous studies in Yazd [34], Isfahan [20], Kerman [24], Shiraz [26], Rasht [11], and Zahedan [35], the present research showed tinea pedis (3.5%) to be the less frequent type of dermatophytosis; however, our finding was in agreement with a study by Shamsian et al. in Mashhad [25]. In the present study, only one case of tinea pedis was observed in a female patient, caused by *T. mentagrophytes*; this finding confirms the results of previous research in Iran [9, 36].

In this study, the common age group affected by dermatophytosis was ≤ 29 years (57.5%). Our findings were similar to several studies [4, 12, 19, 24-28], while in contrast with previous reports from Iran [20, 35, 36, 38, 39]. Moreover, similar to several studies [12, 25, 26, 34, 38], the present research like some other studies indicated that the frequency of dermatophytosis in males (53.9%) is higher than females (46.1%). However, studies in Kerman, Rasht, and Kermanshah [11, 24, 29]

reported the high rate of dermatophytosis in females rather than males.

The incidence rate of dermatophytosis varies in different regions of Iran. Hot and humid environments provide favorable conditions for better growth of dermatophytes. This leads to the higher frequency of this fungal infection in cities with hot and humid climatic conditions such as Ahvaz and Bandar Abbas in comparison with other regions in Iran.

Dermatophytosis is one of the common cutaneous fungal infections in Yazd, Iran. Public health care and self hygiene play important roles in the control and prevention of this contagious disease. Notable changes in clinical forms and causative agents of dermatophytosis have been observed in different parts of the world including the United States and Europe.

An increase in anthropophilic cases of dermatophytic infections has been reported in Europe, while *M. canis* is still the major cause of tinea corporis in Mediterranean countries. However, in the Middle East, tinea corporis is widely caused by *T. mentagrophytes* [40]. The discrepancy between the findings may be an outcome of diversity in the cultural background, socioeconomic, geographical, and climatic conditions, close contact with domestic and wild animals, and use of public health and recreational facilities.

The present study is the second report of cutaneous dermatophytosis in Yazd since 2001. The discrepancy between our analysis and previous research may be a result of the above mentioned factors and migration of people with different traditions and cultures from rural to urban regions of Yazd.

Conclusion

In comparison with previous research, epidemiology of dermatophytosis has changed in Yazd over the past decades. Therefore, periodical investigations on the epidemiological aspects of this infection are required for the efficient control and prevention of this cutaneous disease.

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Authors' Contributions

S.R. and H.ST. collected the samples and performed all the tests. M.F., P.K., and M.S. were responsible for the practical section of the study. F.Z. designed and managed the study, and F.Z. and S.M. wrote and revised the final manuscript.

Conflicts of Interest

There was no conflict of interest in the present study.

Financial Disclosure

The authors report no financial interests related to the materials of this manuscript.

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