Short Communication

Epidemiological survey of dermatophytosis in Damascus, Syria, from 2008 to 2016

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Abstract

Background and Purpose: It is important to follow annually the probable changes in distribution pattern of dermatophytosis and its etiological agents in different communities. In this study, we determined the prevalence of dermatophytosis and its causative agents in Damascus, Syria, between 2008 and 2016.

Materials and Methods: A total of 4080 outpatients who visited the dermatological clinics in Damascus, were evaluated. The specimens were collected from clinically suspected tinea. The patients were referred to our laboratory for direct examination by 30% KOH. Some of the specimens were cultured on Sabouraud Dextrose Agar for fungal identification.

Results: Out of the 4080 cases, 1138 cases were positive in direct examination(%27.89) , including Tinea pedis (%46.98), followed by tinea capitis(%39.79) , tinea corporis (%25.38), toenail onychomycosi (%20.33), tinea manuum (%16.06), and fingernail onychomycosis .(%15.22) Tinea pedis and toenail onychomycosis were more common in summer %41.19) and %25.78 respectively .(*Trichophytic rubrum* was the most prevalent fungal pathogen, especially in toenail onychomycosis.

Conclusion: Dermatophytosis is highly prevalent in Syria .This study provides valuable data for differential diagnosis of dermatophytosis.

Keywords: Damascus, Dermatophytosis, Syria

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Introduction

Dermatophytes are aerobic fungi that produce protease and keratinase, which digest keratin and allows colonization, invasion, and infection of the stratum corneum of the skin, the hair shaft, and the nail. Infection is generally cutaneous and restricted to the nonliving cornfield layers because the fungi are not able to penetrate the deeper tissue or organ of healthy immune-competent host.

The infection is commonly attributed to ringworm or tinea. Cutaneous fungal infections can be caused by dermatophytes, yeasts, and non-dermatophyte molds, although dermatophytes cause most of the cutaneous fungal infections. Dermatophytes are molds belonging to the three genera of imperfect fungi including *Microsporum*, *Trichophyton*, and *Epidermophyton*.

Different epidemiological reports have documented that dermatophytosis has remained a public health problem in many communities [1]. Epidemiology of dermatophytosis may change based on alterations in some conditions including climate, socioeconomic, lifestyle, immigration, and war.

Herein, we aimed to determine the prevalence of cutaneous mycosis, especially dermatophytosis, in Damascus, Syria, which has a hot and humid climate and is more favorable for the development of different superficial mycoses. In Syria, studies on the prevalence of dermatophytosis are rare; only one study was published on this subject over the past eight years [1].

Materials and Methods

The study population included 4080 patients clinically suspected of having dermatophytosis.

Specimens were collected in our mycological laboratory between September 2008 and June 2016 from various body sites by scraping the active edge of the affected skin and fingernail, as well as clipping, and epilating of the infected lusterless hair. The samples were subjected to direct microscopic examination using 30% KOH solution.

A total of 179 collected specimens were cultured on Sabouraud Dextrose Agar 4% (Avonchem Ltd, UK). Cultures were incubated at 25°C for up to 28 days and checked for growth twice a week. Negative cultures were confirmed after four weeks of no

growth. Fungal isolates were identified based on colony morphology and micromorphology of microconidia and macroconidia, nature of sporulation, special structures such as spirals, racquet hyphae, and chlamydospores [2]. The demographic information including age, gender, and season of the disease were collected by a questionnaire.

Statistical analysis was performed using Minitab ver. 17 (2010). The percentage rates and the confidence intervals were applied to describe the prevalence of each studied factor. The Z-test was utilized for measuring the ratios and to assess the significance of the difference between these ratios. A P-value less than 0.05 was considered statistically significant [3].

Results and Discussion

In the present study, a total of 4080 patients, comprising of 57.50% female patients, were enrolled. Out of the 4080 cases, 1138 (27.89 %) were positive on direct KOH examination, while 2912 (72.11 %) cases were negative.

In rural India, the positive rate is very similar to our finding (27.6 %) [4], but in other studies the positivite rate ranged from 14.2 % to 52.2 % [5-12]. This variation may be due to the climatic condition. The distribution of clinical types in suspected cases was as follows: toenail onychomycosis 1126, tinea corporis 930, tinea pedis 679, tinea capitis 598, fingernail onychomycosis 473, and tinea manuum 274.

From the 679 suspected cases of tinea pedis, 319 (46.98% CI: 0.42-0.52) cases were positive in direct examination as the most common dermatophytosis. Similar findings were reported by Kak et al. in India [13] and by Abastabar et al. in Iran [14]. This positive rate was in agreement with findings of a similar study by Kawai et al. in Japan (46.1%) [15], while this rate was lower than the rate reported by Cai et al. in China (71.19%) [16]. All the positive cases were observed in adults, and this condition was not diagnosed in children. This type of infection is generally of low incidence in children as mentioned in studies conducted in Nigeria and Ethiopia [17, 18]. The positive rate was higher in males (54.23%) than females (45.76%; *P=0.03*). The study of Didehdar et al. in Iran showed that the frequency of dermatophytosis was higher in males than females [19]. In this study, dermatophytosis were more frequently isolated (99.05%) than candidiasis (0.95%).

The suspected tinea capitis cases consisted of 463 children and 135 adult. In addition, 238 (39.79%, CI: 0.35-0.45) children were found positive by direct exam as reported in India [20]. In the Nigerian community, the incidence of this tinea was 35.2%, which is slightly similar to our result [17], but it was lower in an Ethiopian study (8.7%) [18]. In our study, male children were more frequently infected with tinea capitis than female children (65.12%, 34.88%, respectively; *P=0.00*). The higher incidence in males could be due to their higher contact with animals or some activities that are more common among males than females. Microsporic tinea was more frequent (82.35 %) than trichophytic tinea (17.65 %). The same result was published in Italy [21], which showed that ectothrix pattern of hair invasion is more common (72%). In contrast, the studies carried out in Kenya and Palestine showed higher prevalence rate of *Trichophyton* spp. than *Micropsorum* spp. in children [22, 23].

From a total of 930 suspected tinea corporis, only 236 (25.38%, CI: 0.22-0.29) cases were positive in direct examination. There was no significant difference between males and females in this regard (*P=0.09*). Most positive cases were observed in adults (87.71%), compared to children (12.29%). Dermatophytes were the most frequently (80%) isolated fungi (Table 1). The obtained rate in this study were higher compared to that reported from Nigeria (5.8%) [17].This type of tinea was the most prevalent in Iranian studies [24, 25].

The positive rate of toenail onychomycosis in our study was 20.33% (CI: 0.18-0.23) by direct exam, while in Serbia this rate was 85.98% [26]. However, this rate was 14.2% in Italy [8] and 23.7% in Japan [18]. In the current study, females were more positive than males (58.51% and 41.48%, respectively; *P=0.00*). All the positive cases were observed in adults, and this condition was not diagnosed in children in an Ethiopian study [16]. Analysis of feet and hand onychomycosis in

Table 1. The distribution of isolated fungi in relation of fungal infection

Fungal Infection	Cultures	Positive	*Trichophyton rubrum*	*Candida spp*	*Aspergillus spp*	*Micropsorum canis*	*Trichophyton interdigitale*
Toenail onychomycosis	107	37	31	4	1	0	1
Fingernail onychomycosis	59	26	0	25	1	0	0
Tinea corporis	8	5	2	1	0	2	0
Tinea pedis	3	1	1	0	0	0	0
Total	177	69 (38.98)	34 (49.27%)	30 (43.47%)	2 (2.89%)	2 (2.89%)	1 (1.44%)

Table 2. The percentage of fungal infection in different seasons

Fungal infection	Seasons			
	Winter	Spring	Summer	Autumn
Tinea pedis	21.80	25.7	41.19	26.1
Tinea capitis	31.95	24.10	10.69	13.65
Tinea corporis	25.18	20.58	14.5	27.30
Toenail onychomycosis	15.41	19.54	25.78	17.67
Fingernail onychomycosis	3.75	6.18	4.40	11.64
Tinea Manuum	3.75	3.90	3.77	3.61

this study showed an increased relationship between dermatophytes and *Candida* species. In our study, *Candida* species have high incidence in fingernail onychomycosis, while dermatophytes had a relatively low incidence; in toenail onychomycosis, the opposite was true. Our results are similar to those of studies performed in China and India [19, 20].

From the 274 suspected cases of tinea manuum, 44 (16.06%, CI: 0.12-0.22) samples were positive by direct exam. There are few studies available on the epidemiology of tinea manuum at present. In our study, dermatophyte infection was more common than *Candida* infection (93.08% and 6.92%, respectively).

The difference between males (53.92%) and females (45.14%) was not significant (*P=0.07*). All the positive cases were observed in adults, and no such cases were diagnosed in children. In the 473 suspected cases of fingernail onychomycosis**,** 72 (15.22%, CI: 0.12-0.19) cases were positive by direct exam. Distribution frequency of dermatophytes was 44.45%, while this rate for *Candida* spp. was 55.55%. *Candida* infection was more frequent in females (77.5%) than males (22.5%), while dermatophytes infection was equally prevalent in males and females. All the positive cases were observed in adults, and females were more positive (65.27%) than males (34.72%; *P=0.00*), and no cases of this condition were diagnosed in children.

Only 69 from the 177 cultured samples were positive. Of the 69 positive cultures (Table 1), dermatophyte was the most prevalent isolate (53.62 %) followed by yeasts (43.47%) and non-dermatophyte molds (2.85%). Similar results were obtained in China [19].

Trichophyton rubrum was the common isolated organism (49.27%), followed by *Candida* spp. (43.47%), *Micropsorum canis* (from tinea corporis; 2.89%), *Aspergillus* spp. (2.89%), and *Trichophyton interdigitale* (1.44%) (Table 1). *Trichophyton rubrum* is the most prevalent fungal pathogen. Increased incidence of this species was observed in toenail onychomycosis (91.17%).

From the causative fungal species isolated from fingernail onychomycosis, *Candida* spp. were the most frequent fungal species (83.33%). As we have noted, the genus *Trichophyton* was the most common genera of dermatophytes isolated in our study. The prevalence of this causative agent was similar to reports from several regions of the world [12, 13, 18, 20, 26-29].

The frequency of fungal infections vary according to season. The highest frequency of tinea pedis (41.19%) was in summer. Our results are similar to those reported by Sei in Japan [30]. Nonetheless, the highest frequency of cases of tinea capitis were reported in winter and spring (31.95% and 24.10%, respectively). The same result was reported in a similar study conducted in Iran [7].

Tinea corporis increased in winter and autumn (25.18% and 27.30%, respectively), while the incidence rate of toenail onychomycosis was the highest in summer (25.78%; Table 2). In conclusion, when comparing this study to previous ones on the same subject [1], the epidemiology of superficial mycosis in Damascus did not significantly change from 2008.

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Author's contribution

MT.I. designed the study, collected the specimens, performed all the tests, and analyzed the results. MT.I. and A.AK. both wrote the paper and proofread it.

Conflicts of interest

The authors declare no conflicts of interest.

Financial disclosure

The authors have no relevant financial interest in this article.

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