

Characteristics of dermatophytoses among children in an area south of Tehran, Iran

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Summary

The aim of this study was to determine the prevalence and etiological agents of dermatophytoses, and also their distribution according to age, gender, and body site among children in an area south of Tehran. A total of 382 children aged ≤ 16 years suspected to have dermatophytic lesions were examined over a period of 3 years (1999–2001). The incidence rate of dermatophytoses was 6.6 per 100 000 person-years. *Trichophyton violaceum* was the most frequent isolate (28.3%) followed by *Microsporum canis* (15.1%), *Epidermophyton floccosum* (15.1%), *T. rubrum* (13.2%), *T. mentagrophytes* (11.3%), *M. gypseum* (7.5%), and *T. verrucosum* (5.7%). *Tinea capitis* (39.6%) was the most common type of infection, followed by *tinea corporis* (30.2%), *tinea faciei* (18.9%), and *tinea manuum* (7.5%).

Key words: Dermatophytoses, children, epidemiology, Iran.

Introduction

Superficial fungal infections of the skin, including dermatophytoses, are a public health problem in the world especially in economically underdeveloped and developing countries.^{1–12} Some surveys have been carried out in Iran on the clinical and etiological aspects of dermatophytoses;^{7, 13–16} however, the prevalence and distribution of dermatophytoses have not been well defined.

The present study was conducted to determine the prevalence and etiological agents of dermatophytoses, and also their distribution according to age, gender, and body site among children in an area south of Tehran.

Materials and methods

Between March 21, 1999 and March 20, 2001, 1254 patients (children and adults) with suspected dermatophytoses were referred to the Zakaria Razi Mycological Laboratory in southern Tehran. All patients were referred from hospitals, clinics, and medical private offices. Of the 1254 referred patients, 382 were children

aged ≤ 16 years. This mycological laboratory is a well-known referral laboratory, located in southern Tehran, and serves about 800 000 people most of whom come from low and middle socio-economical classes. About half of the population in southern Tehran is in the age of ≤ 16 years. Thus, both the numbers of patients and the size of the populations are known and make our mycological laboratory a good model for epidemiological research.

Skin, hair, and nail samples were taken from patients using scalpels, forceps, and glass slides that had been washed in ethanol and sterilized with a Bunsen burner. Direct microscopic observation of the samples was carried out by examination in 10% KOH. Clinical specimens were cultured on Sabouraud glucose agar (Difco, Detroit, MI, USA) containing 50 mg l⁻¹ chloramphenicol and cycloheximide (SCC) incubated at 25 °C and examined after 7, 14, 21, and 28 days. Negative cultures were excluded at the end of the fourth week. Positive cultures were sub-cultured on plates of SCC. Growing colonies were studied for their morphological and microscopic characteristics.¹⁷

Dermatophytoses incidence rate was estimated by relating the numbers of patients with dermatophytic infections to the number of person-years of observation, as estimated from the 1996 population census.¹⁸ In addition, incidence rates were estimated with 95% confidence intervals (95% CI), using national data. Data

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were compared using analysis of variance and chi-square test as appropriate. The level of statistical significance was set at $P < 0.05$. All statistical analyses were performed using Epi Info for DOS version 6.04 (CDC, USA and WHO Geneva, Switzerland).¹⁹

Results

Of the 1254 clinically suspected tinea cases examined, 382 patients (30.5%) (95% CI: 28–33.1%) were children aged ≤ 16 years (Table 1). Period prevalence of mycological cutaneous infection in children (including dermatophytoses and non-dermatophytoses) was 29.1% (95% CI: 24.7–33.8%). Of a total 382 children with clinically suspected tinea, 53 children (13.9%) (95% CI: 10.7–17.6%) were mycologically positive for dermatophytoses by direct microscopy and/or culture.

In this study, the incidence rate of mycological cutaneous infection (including dermatophytoses and non-dermatophytoses) during the period under study was 13.9 per 100 000 person-years (95% CI: 11.5–16.7%). Moreover, the incidence rate of dermatophytoses in children was 6.6 per 100 000 person-years (95% CI: 5–8.7%).

The distribution of children with dermatophytoses according to age and gender is shown in Table 2. The male-to-female ratio was 1.94:1. The incidence rate of dermatophytoses in males was 17.2 per 100 000 person-years (95% CI: 12.1–23.8%) while in females it was 9.2 per 100 000 person-years (95% CI: 5.6–14.8%) ($P_{(2)} = 0.028$). The mean \pm SD and median age in males were 9.7 (± 4.6) and 10 years while in females they were 10.3 (± 4.3) and 11 years ($P_{(2)} = 0.19$ for comparison of means). There was a statistically significant difference between age groups and gender ($P_{(2)} = 0.017$).

Table 1 Distribution of patients with clinically suggestive lesions according to age and gender.

Age group (years)	No. of patients with clinically suggestive lesions		
	Male (%)	Female (%)	Total (%)
≤ 2	26 (11.5)	9 (5.8)	35 (9.2)
3–4	16 (7)	11 (7.1)	27 (7.1)
5–6	14 (6.2)	14 (9)	28 (7.3)
7–8	33 (14.6)	18 (11.5)	51 (13.3)
9–10	30 (13.3)	22 (14.1)	52 (13.6)
11–12	30 (13.3)	23 (14.7)	53 (13.9)
13–14	37 (16.4)	25 (16)	62 (16.2)
15–16	40 (17.7)	34 (21.8)	74 (19.4)
Total	226	156	382

Table 2 Distribution of patients with mycological-positive lesions according to age group and gender.

Age group (years)	No. of mycological-positive patients		
	Male (%)	Female (%)	Total (%)
≤ 2	4 (11.4)	3 (16.7)	7 (13.2)
3–4	2 (5.7)	2 (11.1)	4 (7.5)
5–6	1 (2.8)	5 (27.8)	6 (11.3)
7–8	4 (11.4)	3 (16.7)	7 (13.2)
9–10	2 (5.7)	1 (5.5)	3 (5.7)
11–12	4 (11.4)	2 (11.1)	6 (11.3)
13–14	2 (5.7)	0 (0)	2 (3.8)
15–16	16 (45.9)	2 (11.1)	18 (34)
Total	35	18	53

Table 3 Isolated dermatophyte species according to gender, mean, and median age.

Species	Total (%)	Gender		Age (years)	
		Male (%)	Female (%)	Mean \pm SD	Median
<i>Trichophyton violaceum</i>	15 (28.3)	9 (25.7)	6 (33.3)	8 (± 5.7)	7
<i>Microsporum canis</i>	8 (15.1)	6 (17.1)	2 (11.1)	9.4 (± 4.6)	9.5
<i>Epidermophyton floccosum</i>	8 (15.1)	6 (17.1)	2 (11.1)	10 (± 6.2)	11.5
<i>T. rubrum</i>	7 (13.2)	3 (8.6)	4 (22.2)	10 (± 4.3)	11
<i>T. mentagrophytes</i>	6 (11.3)	4 (11.4)	2 (11.1)	10.6 (± 6.6)	13
<i>M. gypseum</i>	4 (7.5)	3 (8.6)	1 (5.6)	10.7 (± 3.4)	10
<i>T. verrucosum</i>	3 (5.7)	3 (8.6)	0 (0)	15 (± 1)	15
<i>T. tonsurans</i>	1 (1.9)	1 (2.9)	0 (0)	8 (± 0)	8
<i>T. schoenleinii</i>	1 (1.9)	0 (0)	1 (5.6)	11 (± 0)	11
Total	53	35	18	–	–

The nine dermatophyte species isolated and their frequencies are shown in Table 3. There was no statistically significant difference between the frequency rate of dermatophyte species in males and females ($P_{(2)} > 0.05$) (Table 3). The mean \pm SD and median age according to the dermatophyte species is shown in Table 3. There were no statistically significant differences between the mean ages of patients in this study ($P_{(2)} = 0.71$).

Table 4 shows the distribution of dermatophyte species according to age groups. The frequency rate for all the types of tinea was higher in males than in females, except for tinea manuum; however, no statistically significant differences were found ($P_{(2)} = 0.25$). The mean \pm SD and median age according to dermatophyte species is shown in Table 5. There was no statistically significant difference between mean age with type of tinea ($P_{(2)} = 0.33$).

Table 4 Distribution of dermatophyte species according to age group.

Age group (years)	<i>T. violaceum</i>	<i>M. canis</i>	<i>E. floccosum</i>	<i>T. rubrum</i>	<i>T. mentagrophytes</i>	<i>M. gypseum</i>	<i>T. verrucosum</i>	<i>T. tonsurans</i>	<i>T. schoenleinii</i>
≤2	3	1	2	0	1	0	0	0	0
3–4	4	0	0	0	0	0	0	0	0
5–6	0	1	1	3	1	0	0	0	0
7–8	2	1	1	0	0	2	0	1	0
9–10	0	2	0	0	1	0	0	0	0
11–12	1	1	0	2	0	1	0	0	1
13–14	1	0	0	0	0	0	1	0	0
15–16	4	2	4	2	3	1	2	0	0
Total	15	8	8	7	6	4	3	1	1

Table 5 Gender, mean, and median age of children with dermatophytoses according to type of tinea.

Type of tinea	Gender		Age (years)	
	Male (%)	Female (%)	Mean ± SD	Median
<i>T. capitis</i>	15 (42.8)	6 (33.3)	8.2 (±5.1)	8
<i>T. corporis</i>	12 (34.3)	4 (22.2)	11.1 (±6.1)	15
<i>T. faciei</i>	6 (17.1)	4 (22.2)	10.9 (±3.9)	11
<i>T. manuum</i>	1 (2.9)	3 (16.7)	9 (±4.9)	7
<i>T. cruris</i>	1 (2.9)	1 (5.6)	10 (±2.8)	10
Total	35	18	9.9 (±4.5)	10

The frequency rate of dermatophytes according to the type of tinea in children is shown in Table 6.

Discussion

To our knowledge, the present study is the first epidemiological survey of dermatophytoses in children in an area south of Tehran. This study showed that the period prevalence of dermatophytoses in children in this

area was 13.9% with the incidence rate of 6.6 per 100 000 person-years. The incidence rate of dermatophytoses among children in this study could be underestimated, because some patients with dermatophytoses might be treated in clinics or private offices only based on clinical signs/symptoms and without referring for further mycological laboratory testing.

The period prevalence and incidence rate of mycological cutaneous infection in children (including dermatophytoses and non-dermatophytoses) was 29.1% and 28.3% per 100 000 person-years, respectively. The period prevalence of mycological cutaneous infection (including dermatophytoses and non-dermatophytoses) among children in different parts of Iran varied from 1 to 2%.^{20–23} In the city of Kashan (central Iran), 1.36% of children in primary school had mycological cutaneous infection (including dermatophytoses and non-dermatophytoses),²⁰ as against 2% in Chahbahar (southeastern Iran – a tropical area)²¹ and 2% in city of Brojerd (western Iran).²² It is obvious that the rate of mycological cutaneous infection in children (including

Species of dermatophytes	Type of lesion					Total
	<i>T. capitis</i>	<i>T. corporis</i>	<i>T. faciei</i>	<i>T. manuum</i>	<i>T. cruris</i>	
<i>Trichophyton violaceum</i>	11 (52.3)	3 (18.7)	1 (10)	–	–	15
<i>Microsporum canis</i>	5 (23.7)	–	2 (20)	1 (25)	–	8
<i>Epidermophyton floccosum</i>	–	5 (31.3)	–	2 (50)	1 (50)	8
<i>T. rubrum</i>	–	3 (18.7)	3 (30)	–	1 (50)	7
<i>T. mentagrophytes</i>	1 (4.8)	3 (18.7)	1 (10)	1 (25)	–	6
<i>M. gypseum</i>	1 (4.8)	–	3 (30)	–	–	4
<i>T. verrucosum</i>	1 (4.8)	2 (12.6)	–	–	–	3
<i>T. tonsurans</i>	1 (4.8)	–	–	–	–	1
<i>T. schoenleinii</i>	1 (4.8)	–	–	–	–	1
Total	21	16	10	4	2	53

Values are number of isolates with distribution percentage of species in parentheses.

Table 6 Frequency rate of dermatophytes according to type of tinea in children.

dermatophytoses and non-dermatophytoses) in this study is lower than other Iranian series. This might be due to the fact that in previous studies, the sample was a combination of rural and urban populations. Moreover, different geographical locations could be another important factor for this difference.

A few epidemiological studies on dermatophytoses in children have been published as regards different geographical parts of Iran. The prevalence of dermatophytoses among primary school children in the city of Varamin (south of Tehran) was 0.05%,²⁴ which is lower than the rate in our study. In this study 169 of 1254 patients were diagnosed with dermatophytoses. Of the 169 patients with dermatophytoses, 53 were children (31.4%). In a study of dermatophytoses in Hamadan (west of Iran),¹⁵ 86.8% (225/259) of the patients with dermatophytoses were patients aged ≤19 years, which is higher than our study (31.4%). This difference is due to the fact that the patients in this study were residents of Tehran (urban area). However, in the study from Hamadan, patients were a combination of rural and urban residents.

Epidemiological studies of dermatophytoses, especially studies that are population-based, and thus allow for the calculation of incidence rates of dermatophytoses, provide valuable information for identifying high-risk groups for specific types of tinea and for planning effective control/prevention strategies. In this study we calculated the incidence rate of dermatophytoses, which is a positive point for our study. However, none of the above-mentioned studies reported incidence rates for dermatophytoses in the population. Thus we could not compare the incidence rate of dermatophytoses in this study with others.

From the available data, males were affected more than females. The incidence rate of dermatophytoses in males (17.2 per 100 000 person-years) was significantly higher than in females (9.2 per 100 000 person-years) ($P_{(2)} = 0.028$). The reason for this is not fully understood, but it indicates that gender may influence susceptibility to particular forms of these infections.^{9, 25} This is in agreement with other studies in Iran.^{13, 15}

In our study, about half of the patients (49.1%) were in the 11–16-year age group. This is comparable with the results of Omidynia *et al.*¹⁵ However, other studies from Iran showed that the most common age group of children with dermatophytoses was 5–9 years.^{24, 26, 27}

The type and severity of infection caused by dermatophytic fungi in children vary with age, gender, and the causative agent.^{28–31} Tinea differs according to geo-

graphical distribution; not only different pathogens but also differences in incidence have been reported.

In the present study, *Trichophyton violaceum* was the most frequent dermatophyte isolated followed by *Microsporum canis*, *Epidermophyton floccosum*, *T. rubrum*, and *T. mentagrophytes*. In general, *Trichophyton* spp. (62.3%, 33/53) (20 males and 13 females) was the most common dermatophyte isolate followed by *Microsporum* spp. (22.6%, 12/53) (nine males and three females) and *Epidermophyton* spp. (15.1%, 8/53) (six males and two females). However, no statistically significant difference was found between the dermatophyte species and gender ($P_{(2)} = 0.56$).

An epidemiological study of dermatophytoses from the city of Varamin (south of Tehran),²⁴ Bandar-Abbas (southern Iran – a tropical area),³² and Chahbahar (southeastern Iran – a tropical area)²¹ showed that *T. violaceum* was the most common dermatophyte agent among children. In the study of Omidynia *et al.* from Hamadan (west of Iran) *Trichophyton* spp., including *T. verrucosum* and *T. schoenleinii*, were the main isolated dermatophytes among children.¹⁵ In the cities of Ahwaz and Dezfol (southwestern Iran – a tropical area), *M. canis* was the most frequent dermatophyte agent among children.^{26, 27} In addition, a study from the city of Mahalat (central Iran) showed that *T. schoenleinii* was the main etiological agent among children.²³ These differences may be explained by the existence of particular environmental conditions that influence the presence and prevalence of the dermatophyte species. In this study clinical specimens were taken from patients in different epidemiological settings such as hospitals and private clinics; therefore, the epidemiological patterns of dermatophytoses in our study differ from other studies. Furthermore, urban residents constituted the sample population in our study compared with urban and rural residents in other studies.

Tinea capitis

Our study showed that, among the patients surveyed, tinea capitis was the most common form of infection (39.6%, 21/53). Some literature reports showed that in Hamadan 62.9%,¹⁵ Esfahan 45.6%,¹⁴ Tehran 28.6%,³³ Khozestan 75%,²⁶ Yazd 45.2%,³⁴ and in northern Iran³⁵ 44.4% of the patients were respectively affected with tinea capitis. The difference between the data of those reports and our results could be due to the sample size and regional differences. The high incidence of tinea capitis in children has been attributed, among other reasons, to low fungistatic fatty acid levels and also to

the spread of infections through infected barbering instruments.^{24, 36}

In this study *T. violaceum* and *M. canis* were the most prevalent dermatophytes causing tinea capitis. Studies from Chahbahar (southeastern Iran – a tropical area)²¹ and city of Varamin (south of Tehran)²⁴ reported *T. violaceum* as the most common dermatophyte among children with tinea capitis. However, some Iranian studies showed that in Ahwaz²⁶ and Bandar-Abbas³² *M. canis*, and in Mahalat²³ *T. schoenleinii* were the most frequent isolated dermatophytes. Omidynia *et al.*¹⁵ found *T. schoenleinii* and *T. verrucosum* as the most frequent dermatophytes causing tinea capitis in children from Hamadan (western Iran).

In this study, tinea capitis was more frequent in boys than in girls. This is similar to other Iranian studies.^{15, 26, 27, 32} Sexuality had no effect on the spread of tinea capitis in the general population. However, labor in fields, contact with infected cattle and lack of head scarfs (covering of women's head is an Islamic rule) might be responsible for the spread of tinea capitis in boys in Iran.

Tinea capitis was seen more in children aged <10 years in this study, which is obviously in agreement with a study from Hamadan.¹⁵ This has been mainly attributed to the sensitivity of dermatophytes to certain sebaceous gland secretions that first appear at puberty and persist into adulthood, especially in males.³⁷

Tinea corporis

Tinea corporis ranked second in prevalence and accounted for 30.2% of all infections examined in this study. This is accordance with a study in Iran.¹⁵ *Epidermophyton floccosum* was the main etiological agent followed by *T. violaceum*, *T. rubrum*, and *T. mentagrophytes*. However, Omidynia *et al.*¹⁵ reported *T. verrucosum* and *T. schoenleinii* as the main etiological agents of tinea corporis from Hamadan (western Iran).

In this study, tinea corporis was more frequent in male children than in females. This is similar to the study of Omidynia *et al.*¹⁵ Moreover, our findings showed that tinea corporis was seen more frequently in children aged ≥10 years, which is in agreement with the study of Omidynia *et al.*¹⁵

Tinea faciei and Tinea manuum

Tinea faciei is the third common form of tinea and accounted for 18.9% (10/53) of all infections. This is in contrary to the study of Omidynia *et al.*¹⁵

Trichophyton rubrum and *M. gypseum* were the main etiological agents of tinea faciei in this study. However, *T. verrucosum* was the most common etiological agent in patients with tinea faciei in Hamadan (western Iran).¹⁵ Most of the patients with tinea faciei in Hamadan (Iran) were from a rural area; however, our patients in this study were urban residents. Thus different epidemiological settings (urban vs. rural) could explain the difference in the pattern of etiological agents in the two studies. In this study tinea faciei was more frequent in male children (six cases) than in females (four cases), which is similar to a study of dermatophytoses in Hamadan (western Iran).¹⁵

Tinea manuum is the fourth common form of tinea and accounted for 7.5% of all infections. *Epidermophyton floccosum* was the main etiological agent of tinea manuum in this study. This is in contrary to the study of Omidynia *et al.*¹⁵, which reported *T. verrucosum* as the main etiological agent of tinea manuum. In this study, tinea faciei was more frequent in girls than in boys, comparable with a previous study.¹⁵

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