Dermatomycoses in children and adolescents: a retrospective study over a 5-year period

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Summary

Superficial fungal infections are very common in the general population, and are frequently encountered in childhood and adolescence. There are however relatively scarce data regarding the epidemiology of dermatomycoses in patients belonging to such age groups. The aim of our study was to assess the prevalence, etiological aspects and clinical manifestations of dermatomycoses diagnosed in patients with age less than 18 years attending the Micology Service of the Dermatology Clinic, University of Bari, Southern Italy, during the period 2008-2012. The 5-year retrospective analysis has shown that dermatomycoses in people younger than 18 years represent 7% of the total cases diagnosed with skin mycoses. There was a clear-cut predominance of dermatophytoses as etiological agents, involved in approximately two thirds of cases. Nearly half of dermatomycoses affected patients aged between 11 and 17 years, and most clinical variants were found to be more common within this age range, with the exception of tinea faciei and tinea capitis, which involved more frequently people aged 6-10 years and 2-5 years, respectively.

KEY WORDS: dermatomycoses; fungal infections; epidemiology; children; adolescents.

Introduction

Dermatomycoses are considered among the most frequent forms of human infections, and their incidence is constantly increasing (1, 2). Causative agents of dermatomycoses vary with age and the site of involvement. To the best of our knowledge, there are not precise recent data regarding the actual prevalence and etiologic aspects of fungal skin infections among Italian children and adolescents.
The aim of our study was to analyse the incidence of dermatomycoses and the corresponding etiological aspects among patients aged up to 17 years attending the Dermatology Clinic of the University of Bari, Southern Italy, between 2008 and 2012.

Materials and methods

This 5-year retrospective study involved all outpatients and inpatients attending the Mycology Service of the Dermatology Clinic of Policlinico Hospital - University of Bari from January 2008 to December 2012. Skin scales, plucked hairs, nail clippings and subungual debris were collected to obtain material for direct microscopic examination and culture (3). Samples used for microscopy were put on glass slides and treated with a solution containing 20% KOH, dimethyl sulfoxide and chlorazole. Samples were also inoculated into Sabouraud dextrose agar with the addition of chloramphenicol and gentamicin to inhibit the growth of bacteria, as well as onto medium containing chloramphenicol and cycloheximide (Mycosel agar) to inhibit the growth of saprophytic fungi, as appropriate. Olive oil was added into Sabouraud's dextrose agar medium when pityriasis versicolor was suspected. Cultures without evident fungal growth were held for 3 weeks before being regarded as negative. The identification of individual strains was based on macroscopic and microscopic features of the colonies.
Children and adolescents with dermatomycoses were divided into four age groups: <2, 2-5, 6-10, and 11-17 years.

Results

In the period 2008-2012, clinical samples for mycological examinations were taken from a total of 4,549 patients, and 365 of them (8%) were subjects aged less than 18 years. In the same period, dermatomycose diagnosis was confirmed in a total of 1,674 adult and pediatric patients. Superficial fungal infections were

diagnosed in 118 (32%) of children and adolescents, consisting of 55 females and 63 males, with a mean age of 10.2 years (age range, 2-17 years). All affected patients were Caucasian but four who were from North Africa.

In particular, the 118 patients with superficial fungal infections were found to be affected by *Candida* infection in 9 cases, dermatophytoses in 85 cases, and pityriasis versicolor in 24. The most frequent clinical forms were tinea corporis, tinea capitis and pityriasis versicolor, followed by onychomycosis (Table 1). The last form was caused more frequently by dermatophytes than *Candida*, whereas non-dermatophytic moulds were never isolated as causative species. Two children were found to suffer from two concomitant types of dermatomycosis represented by tinea pedis and tinea cruris both caused by *Trichophyton* (*T.*) *rubrum* in a case, and by tinea corporis and tinea capitis due to *Microsporum* (*M.*) *canis* in the other case. Nearly half of juvenile cases of dermatomycosis involved the age group between 11 and 17 years, and all the clinical variants were more common in this age range, with the exception of tinea capitis which had its highest prevalence in children aged between 2 and 5 years and tinea faciei that was most frequently observed in the ages between 6 and 10 (Table 1).

Table 2 shows the distribution of etiological agents according to clinical type/site of involvement, while Table 3 reports the causative species according to the age group.

The fungal agent isolated most frequently was *M. canis,* followed by *T. rubrum* and *Malassezia furfur. M.*

Table 1 - Clinical variants of dermatomycosis according to the age group.

Clinical form	***< 2 yrs***	***2-5 yrs***	***6-10 yrs***	***11-17 yrs***	***Total***
T. corporis	0	6 (23%)	8 (31%)	12 (46%)	26 (21.5%)
T. pedis	0	0	2 (25%)	6 (75%)	8 (6.5%)
T. faciei	0	2 (18%)	6 (54.5%)	3 (27.5%)	11 (9%)
T. capitis	0	14 (58.5%)	9 (37.5%)	1 (4%)	24 (20%)
T. versicolor	0	2 (8.5%)	1 (4%)	21 (87.5%)	24 (20%)
Onychomycosis	0	0	6 (31.5%)	13 (68.5%)	19 (16%)
Flexural involvement	0	2 (25%)	1 (12.5%)	5 (62.5%)	8 (7%)
Total	***0***	***26 (21.5%)***	***33 (27.5%)***	***61 (51%)***	***120^***

^Two patients presented each with two concomitant clinical variants

Table 2 - Causative species according to clinical type.

	T. corporis	***T. pedis***	***T. capitis***	***T. faciei***	***Nails***	***Flexures***	***T. versicolor***	***Total***
M. canis	18 (69%)	1 (12.5%)	14 (58.5%)	4 (36.5%)	0	1 (12.5%)	0	38 (31.5%)
T. rubrum	4 (15%)	6 (75%)	3 (12.5%)	1 (9%)	11 (58%)	4 (50%)	0	29 (24%)
T. mentagrophytes	2 (8%)	1 (12.5%)	0	3 (27.5%)	2 (10.5%)	0	0	8 (6.5%)
T. violaceum	1 (4%)	0	6 (25%)	0	0	0	0	7 (6%)
E. floccosum	1 (4%)	0	0	2 (18%)	0	0	0	3 (2.5%)
T. gypseum	0	0	0	1 (9%)	0	0	0	1 (1%)
T. tonsurans	0	0	1 (4%)	0	0	0	0	1 (1%)
Candida	0	0	0	0	6 (31.5%)	3 (37.5%)	0	9 (7.5%)
Malassezia furfur	0	0	0	0	0	0	24	24 (20%)
Total	***26***	***8***	***24***	***11***	***19***	***8***	***24***	***120^***

^Two patients presented each with two concomitant clinical variants

Table 3 - Etiological agents of dermatomycosis according to the age group.

	< 2 yrs	**2-5 yrs**	**6-10 yrs**	**11-17 yrs**	**Total**
M. canis	0	12 (32.5%)	13 (35%)	12 (32.5%)	37 (31%)
T. rubrum	0	6 (21%)	5 (18%)	17 (61%)	28 (24%)
T. mentagrophytes	0	0	4 (50%)	4 (50%)	8 (7%)
T. violaceum	0	5 (71%)	2 (29%)	0	7 (6%)
E. floccosum	0	0	2 (67%)	1 (33%)	3 (2%)
T. gypseum	0	1 (100%)	0	0	1 (1%)
T. tonsurans	0	0	1 (100%)	0	1 (1%)
Malassezia	0	2 (8%)	1 (4,5%)	21 (87.5%)	24 (20%)
Candida	0	0	2 (22%)	7 (78%)	9 (8%)
Total	***0***	***26 (22%)***	***30 (25.5%)***	***62 (52.5%)***	***118***

canis was the most common agent responsible for tinea corporis and tinea capitis, and *T. rubrum* for tinea pedis and onychomycosis.

Discussion

Our 5-year retrospective analysis showed that dermatomycoses in patients aged less than 18 years represent nearly 7% of the total fungal infections diagnosed in the Mycology Service of our Clinic. Dermatophytes were by far the most prevalent cause of dermatomycoses in children and adolescents, in line with data obtained in other paediatric case series (4, 5). Instead, a recent retrospective study from our hospital database has demonstrated the leading etiological role of *Candida* yeasts among patients of all age groups with dermatomycoses who mostly consisted of adults (3), thus showing an increased association with potential risk factors for candidosis (i.e., old age, obesity, diabetes mellitus, use of immunosuppressive drugs, or wet works) compared to children. The same study has shown the predominance of *T. rubrum* among dermatophytes, unlike the case series limited to childhood and adolescence. In these periods, in fact, *M. canis* was found to be the most prevalent fungal isolate, frequently associated with tinea corporis and tinea capitis, in agreement with results of previous studies (6). In the Mediterranean region, especially in Italy, *M. canis* has been shown to be endemic in feral cats (1). The common detection of this zoophilic dermatophyte in paediatric cases might be attributed to the fact that children are particularly prone to contact animals, including feral cats. The high prevalence of tinea capitis in children is a well-known event mainly linked to the absence in the prepuberal ages of sebaceous gland secretions which are active against dermatophytes (7).

In our juvenile patient population, non-dermatophytic moulds were never isolated as causative species of onychomycosis. Similarly, kerion celsi, tinea manuum and sporotrichosis were never detected in our series during the 5-year observational period. No case of fungal infection was diagnosed in children younger than 2 years. In contrast, a retrospective study from Tunisia has showed that, among children with dermatomycoses, 8% were aged 2 years or younger (5). In the Tunisian case series, tinea capitis was found to be the most frequent dermatomycosis before the age of 2 years, and *T. violaceum* was the most prevalent species (5). On the contrary, other authors reported that *C. albicans* and *Malassezia* spp. were the most frequent fungal agents responsible for dermatomycoses in children (4). Actually, *Candida* diaper dermatitis is considered the most frequent *Candida* infection in children, although mycological examinations are not commonly prescribed and systematically performed for this disease, that is diagnosed clinically and treated empirically in most instances (5).

In our experience, clinical manifestations most frequently encountered were, in order of frequency, tinea corporis, tinea capitis and pityriasis versicolor, followed by onychomycosis. The peak of prevalence of most dermatomycoses, including pityriasis versicolor, was observed in the age range from 11 to 17 years, with the exception of tinea capitis and tinea faciei whose frequency was higher among younger children. It is well known that pityriasis versicolor is most prevalent in the post-pubertal age after sebaceous glands become active, and small children are rarely affected (8). Also in our case series the occurrence of pityriasis versicolor appears be relatively infrequent in children less 10 years, although the disease proved to be a possible event at our latitude in small children, even between the ages of 2 and 5 years. Recent reports have demonstrated that pityriasis versicolor is not uncommon among children in the tropics (9).

Our study has several limitations, including the small sample size, and the retrospective nature. It was not aimed at the evaluation of epidemiology of dermatomycoses in the pediatric population of our geographic area, as it has simply described the frequency of dermatomycoses diagnosed through mycological examinations at our Unit.

In conclusion, our retrospective analysis has shown that dermatomycoses are not infrequent among children and adolescents. Dermatophytoses were most prevalent, with a predominant etiological role of *M. canis*. Nevertheless, it is likely that the frequency of *Candida* (especially) and *Malassezia* infections were underestimated in this study as laboratory examinations are seldom required to confirm the diagnosis of *Candida* diaper dermatitis and/or pityriasis versicolor.

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