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Incidence of *Tinea capitis* in São Paulo, Brazil

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Abstract

To determine the incidence of *tinea capitis* in São Paulo, Brazil, an investigation was performed in Private and Public Pediatrics Service involving 4,500 children from 0 to 15 years old during 5 years (1996–2000).Samples were taken from 132 children with suspected fungal infection of the scalp, for direct microscopy and culture. *Tinea* of scalp was mycologically confirmed in 112 patients (85%).Males were more affected than females in all age groups. Children below 8 years old accounted for more than 75% of the occurrences. Only three cases of *tinea capitis* were diagnosed in children from 12 to 15 years of age.*Tinea capitis* was prevalent in 103 cases (91.96%); inflammatory kerion type lesions were diagnosed in 9 patients (8.04%). *Microsporum canis* (70.5%) and *Trichophyton tonsurans* (23.2%) were the most common agents followed by *T. mentagrophytes* (3.6%), *M. gypseum* (1.8%) and *T. rubrum* (0.9%).

Key words: *Microsporum canis*, *Tinea capitis*, *Trichophyton tonsurans*

Introduction

Tinea capitis is caused predominantly by two dermatophytic genera: *Microsporum* and *Trichophyton*. Dermatophytes are a group of fungi that, during their parasitic life, utilize keratin as a substrate, infecting the skin, hairs and nails and thereby cause superficial mycoses in humans and animals [1]. Based on host preference and natural habitat, the etiologic agents are classified into three categories: anthropophilic, zoophilic, and geophilic species [2].

Tinea capitis is the most common fungal infection in the children. It constitutes an important public health problem, especially among schoolchildren worldwide, because it is a highly contagious infection [3, 4].

The clinical manifestations of *tinea capitis* are variable and include: a seborrheic form that is scaling, often without noticeable hair loss; a pustular, crusted pattern, either localized or more diffuse; a black dot variety characterized by small black dots within areas of alopecia; a kerion, which is a inflammatory mass; scaly annular patch and gray patch alopecia [5–8].

The incidence of *Tinea capitis* varies according to the climate, temperature, relative humidity, and precipitation of different geographic regions, as well as the natural reservoirs of infection [7]. Often outbreaks of infection appear to be due to indirect spread via external agents, combs, or hairdressers' equipment, or person-to-person transmission under overcrowded conditions, such as in schools or refugee camps [8].

Considering the importance of this disease and the few recent data on its incidence in Brazil [1, 7], an investigation was performed in order to verify the problem among children population, in Private

and Public Pediatric Medical Services, in São Paulo, Brazil.

Patients and methods

From February 1996 to June 2000, 4,500 children from 0 to 15 years old were examined in Private and Public Pediatric Medical Services, in São Paulo, Brazil. Of these, 132 children with clinically suspected *Tinea capitis* were included in the study. Data regarding clinical symptoms and signs of infection were collected.

The clinical cases were confirmed using direct microscopy and culture. These cases were classified according to their age and sex in groups: 0–3 years old, 4–7 years old, 8–11 years old, and 12–15 years old.

After receiving consents from the parents of these children, affected areas were scraped with a sterilized scalpel (No15) and broken hairs were plucked utilizing sterilized tweeze. One part of the scales and hairs was mounted with 20% KOH plus Parker's blue–black permanent ink (3:1) solution, and observed under the light microscope. The other part was cultured on three media: Sabouraud-glucose agar (Difco®) with chloramphenicol (200 mg/L), Mycosel agar (BBL) and lactrimel agar according to Borelli [9]. All cultures were incubated at 30 °C for 30 days and checked twice weekly.

Dermatophytes were identified based on the macroscopic and microscopic morphology. Negative mycological examinations were repeated. The partial requirement for thiamine was used to separate *T. tonsurans* to *T. mentagrophytes* and *T. rubrum*. Ability to perforate hair *in vitro* was used to separate *T. rubrum* to *T. mentagrophytes*.

Statistical analysis

The description of the observed values was accomplished by the determination of frequency and percentage of infected children and the grouping factors (sex, age groups and infectious agents). The data related to the clinical forms was described by means of frequency and percentage.

To determine the significance of difference on the frequency of children infected within the levels of only on factor (sex, or infectious agent or age group) the chi-square test was employed. The chi-square test was also used to analyze the significance of difference on the frequency of clinical form presented by the etiological agent. As showed by Dalgaard [10], the chi-square test can be used for analyzing the significance of difference among the levels of one factor.

The Fisher's exact test was used to define the significance of association between two factors (sex versus age group, sex versus infectious agent) on the frequency of infected children, and to determine the degree of association between the etiological agent and the clinical form.

The statistical significance was set on $\alpha < 0.05$.

Results

A total of 4,500 children were examined to identify the presence of dermatophytosis on the scalp. Of those, 112 (2.4%) had dermatophyte positive cultures. Clinical specimens from 11 patients were negative in microscopic examination, but positive in culture. Of the patients with *Tinea capitis,* 61% were boys and 39% were girls ($P = 0.0233$). The prevalence of *Tinea capitis* decreased with age. The 0- to 7-year-old group had a prevalence of 79.5%, which were 3 times higher than in the 8- to 15-year-old group (prevalence of 20.5%) ($P < 0.05$).

The most common agents in *Tinea capitis* were *Microsporum canis* (70.5%) and *Trichophyton tonsurans* (23.2%), followed by *T. mentagrophytes* (3.5%) and *M. gypseum* (1.7%). *T. rubrum* was diagnosed from one patient (Table 1). We must consider the percentage to *M canis* significantly superior to the others agents ($P < 0.0001$). It should be pointed out that such distributions did not depend on sex ($P = 0.8954$)

The clinical manifestation of *Tinea capitis* with a gray patch alopecia (92%) was produced chiefly by *M. canis* and *T. tonsurans*. The clinical form kerion type was observed in 8% of cases ($P \leq 0.0001$) (Table 2).

Discussion

Tinea capitis is an important fungal infection that occurs most exclusively in prepubertal children. There are few reports of disease in neonates, adolescents and adults [11–14]. Spontaneous cure usually coincides with onset of puberty. The change in composition of the sebum with an increase of fungistatic fatty acids might accounts for the resolutions of the mycosis [12, 13].

Table 1. Distribution of 112 cases of *Tinea capitis* according to etiologic agents, age, and sex of the children

Groups of age (years)	Sex	Etiological agents										Total	
		Mc		*Mg*		*Tm*		*Tr*		*Tt*			
		N	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%
0–3	Male	18	90.0	–	–	–	–	–	–	2	10.0	20	29.4
	Female	11	84.6	–	–	–	–	–	–	2	15.4	13	29.5
4–7	Male	23	74.2	1	3.2	–	–	–	–	7	22.6	31	45.6
	Female	16	64.0	1	4.0	1	4.0	–	–	7	28.0	25	56.8
8–11	Male	6	42.9	–	–	2	14.3	1	7.1	5	35.7	14	20.6
	Female	3	50.0	–	–	–	–	–	–	3	50.0	6	13.6
12–15	Male	2	66.7	–	–	1	33.3	–	–	–	–	3	4.4
	Female	–	–	–	–	–	–	–	–	–	–	–	–

Mc: *Microsporum canis*; *Tt*: *Trichophyton tonsurans*; *Tm*: *Trichophyton mentagrophytes*; *Mg*: *Microsporum gypseum*; *Tr*: *Trichophyton rubrum*.

Table 2. Distribution of 112 cases of *Tinea capitis* according the clinical form and etiologic agents

Etiological agents	Clinical forms			
	Gray patch alopecia		Kerion like type	
	N	%	*N*	%
M. canis	75	94.9	4	5.1
T. tonsurans	22	84.6	4	15.4
T. mentagrophytes	4	100.0	–	–
M. gypseum	1	50.0	1	50.0
T. rubrum	1	100.0	–	–
Total	103	92.0	9	8.0

M.: *Microsporum*; *T.*: *Trichophyton*; No: Number of cases.

In our investigation, children from 4 to 7 years old represented 50% of the cases. Only three cases (2.8%) were diagnosed in older children (>11-year-old). These data are consistent with other studies [6, 8, 15]. The mycosis was predominant in male children (61%), which is in accordance to many authors [16–18].

The most common occurrence of *Tinea capitis* in short male hairs when comparing with the long female hairs might be due to the exposure of a large site of the corneum stratum which would favor the implantation of the fungus propagules [16, 19]. However, this theory was not confirmed by some authors [6, 20]. The prevalence of *Tinea capitis* in girls from Jordan was attributed to the hygiene difficult [20].

Gray patch alopecia with mild erytema was the predominant clinical form (103/112). Inflammatory *Tinea capitis* characterized by the formation of kerions was diagnosed in nine children who also presented occipital adenopathy.

Microsporum canis and *Trichophyton tonsurans* were the main isolated dermatophytes (103/112). The zoophilic fungus *M. canis* is the most important agent of *Tinea capitis* in Southeast and Southern Brazil [1, 21]. It is a species well adapted to domestic animals such as cats and dogs. Contamination to humans usually occurs through close contact with these animals in the domestic environment [1, 22, 23]. Its incidence is decreasing in developed countries. However, a significant number of infections by this fungus have been registered in many countries [24, 25]. This increase might be due to the increased number of domestic cats and dogs [21]. *M. canis* has been diagnosed in isolated cases or microepidemics [21, 23]. We diagnosed familial microepidemics caused by this fungus in four occasions and epidemics in 8 of 54 children living in an orphanage.

Trichophyton tonsurans is an anthropophilic dermatophyte, and when conditions are favorable it colonizes, causing endemicity. It has replaced *M. audouinii* as the main causative organism of

Tinea capitis in North America, Canada and in many countries of Europe [4, 26]. Infections caused by *T. tonsurans* may be acquired from direct person-to-person contact and from contact with contaminated objects such as combs, blankets, scissors, etc. Asymptomatic fungal infection has been cited as a potential factor in the persistence and spread of *Tinea capitis* [8, 27].

Brazil is a very large country that presents a variety of regional climates, customs, lifestyle, habits, with a diversity of fungal infection, etiologic agents, according to the studied population. In the Southern and Southeast regions, *T. tonsurans* has been isolated in a few numbers of cases, while in the Northern and Northeastern regions, *T. tonsurans* it is well established, and an important agent of *T. capitis* at this time [1, 7, 21, 23]. In the present investigation, *T. tonsurans* was the second most frequent agent causing lesions on the scalp which is an agreement with other authors [1, 21]. A familial microepidemic caused by *T. tonsurans*, which is a common condition, was diagnosed in six occasions [15, 27].

Trichophyton mentagrophytes, a cosmopolitan dermatophyte fungus was the third most common species isolated. In other Brazilian publications, this organism is second or fourth most common [1, 21]. *M. gypseum* is a geophilic dermatophyte, found worldwide but rarely detected as an agent of mycoses in animals and humans [28, 29]. It was the causative agent of *Tinea capitis* in two children (one gray patch alopecia and one kerion *Tinea capitis)*.

Trichophyton rubrum incidence has increased all over the world in all body sites except for the scalp [1, 6, 30) where its occurrence is unusual. In our investigation, *Tinea capitis* caused by *T. rubrum* was only diagnosed in a 10-year-old boy.

The frequency of dermatophytic fungi varies over time in different geographic areas, with socio-economic level of the population examined and reflects population migrations. Periodic investigations performed in each region determine the epidemiology of dermatophytes and will establish efficient measures of dermatophyte infection control.

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