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Tinea Capitis: Trends in Spain☆

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KEYWORDS
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Abstract Considerable information is available on the changing incidence, etiology, clinical forms and management of tinea capitis in Spain. While the condition became epidemic during the 19th century, when it was predominantly caused by anthropophilic dermatophytes, the incidence fell with the advent of treatment with griseofulvin, after which zoophilic dermatophytes became the main etiologic agents. Although the true incidence of tinea capitis in Spain today is unknown, the condition continues to be a public health problem. Ongoing changes are evident in the greater diversity of pathogenic species identified and a renewed increase in anthropophilic dermatophytes, especially associated with immigration. Consequently, unless action is taken to correctly diagnose, treat, and prevent this infection, its prevalence may once again reach epidemic proportions in the near future.

PALABRAS CLAVE
Tinea capitis;
Tiña;
Dermatofitos

Tendencias de la tinea capitis en España

Resumen Podemos encontrar abundante documentación publicada sobre la evolución de la *tinea capitis* (TC) en España, tanto en su incidencia como en su etiología, formas clínicas y manejo terapéutico. Si en el siglo XIX adoptó carácter de epidemia, con predominio de dermatofitos antropofílicos, tras la aparición de la griseofulvina su incidencia descendió y se produjo un viraje etiológico hacia un predominio de los dermatofitos zoofílicos. Aunque hoy en día su incidencia real es desconocida en nuestro medio, la TC sigue siendo un problema de salud pública y su evolución continúa produciéndose, pudiendo apreciarse una mayor diversidad de especies y fundamentalmente un nuevo aumento de los dermatofitos antropofílicos, especialmente en relación con la inmigración. Así, si no se incide en su correcto diagnóstico, tratamiento y profilaxis, su prevalencia puede volver a aumentar alcanzando proporciones de epidemia en un futuro próximo.

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Dermatophytoses (fungal infections of the skin, popularly called ringworm) vary in terms of clinical features and causative agents according to geographic area and even over time in the same geographic area,[1–14] due to a large number of factors, mainly related to climate (humidity and temperature), socioeconomic circumstances (migration, hygiene, war, access to healthcare, etc), and treatment (nonspecific treatment, lack of effective treatments, new treatments, etc).[1,3,9,10,12,15]

These variations need to be studied and accounted for. Although dermatophytoses logically need to be treated according to the etiological diagnosis, based, in turn, on a physical examination and culture,[16] empirical treatment is warranted in cases where lesions are inflammatory and symptomatic, and where there is a risk of contagion; in such cases the choice of treatment and recommendations for appropriate changes in hygiene and diet need to be guided by knowledge of the local epidemiology—by both the dermatologist and primary care physician.[17] This would indicate the need for regular, localized epidemiology studies.[9,18]

In Spain, several studies have collected and analyzed epidemiological data[1,4,7–10,12,19–31] from a regional[6,32,33] and even national[2,5,6,18,34,35] perspective. However, most of these studies collected data over relatively short periods of time, usually no more than one or a few years,[9,10,17,18,20,22–25,27–30,33] although with some notable exceptions.[1,6–8,19] Most were also retrospective studies of preselected populations with dermatologic disorders. Only 2 prospective studies have sought to establish the national incidence of ringworm of the scalp in children in Spain, reporting incidences of 0.23% and 0.64%.[29,30] However, these studies are subject to selection bias: since they were conducted in urban areas with large immigrant populations, they were only partially representative of the Spanish population. Worthy of mention, nonetheless, are several large national studies regarding trends in dermatophytosis in Spain up to the late 20th century, based on analysis and review of studies published over many decades; noteworthy examples are the studies by Crespo et al.[2] in 1999 and Pereiro et al.[34] in 1996.

Ringworm of the scalp, or tinea capitis, is an infection of the scalp caused by dermatophytes of the genera *Microsporum* or *Trichophyton*.[3,31,36] Tinea capitis, which occurs most frequently in children, remains the most common fungal infection among this population.[3,17,36] In adults it is relatively rare but not unheard of, and mainly affects perimenopausal and elderly women. As we will see below, there have been clear trends in tinea capitis over the last few centuries in Spain, yet few national studies have been implemented that document this fungal infection.[17,19,30,37] Tinea capitis was epidemic and a major public health problem in the 19th century in much of Europe, including Spain.[3,19,38] Infectious agents were mainly anthropophilic, with *Microsporum audouinii*, *Trichophyton schonleinii*, *Trichophyton violaceum*, and *Trichophyton tonsurans* prevailing as causative agents in most of Western Europe (including Spain) and in the Mediterranean region.[2,3,34] Especially prevalent was a particular type of inflammatory tinea capitis, called tinea favosa, or favus,[3] usually caused by *T schoenlinii*.[5] By the mid-20th century, the use of griseofulvin and improved hygiene significantly reduced the number of cases of tinea capitis[3,7,38] by reducing the incidence of anthropophilic infections: the favus agent (*T schonleinii*) and certain microsporum-induced tineas (mainly those caused by *M audouinii)* virtually disappeared, and there was a significant decrease in the trichophytic tinea capitis agents (*T tonsurans* and *T violaceum*). The previously frequent outbreaks of tinea capitis in schools caused by the spread of anthropophilic dermatophytes were thus brought under control. Meanwhile, the anthropophilic agents came to be displaced (both in Spain and the rest of Europe) by zoophilic species (mainly *Microsporum canis* and *Trichophyton mentagrophytes* var. *mentagrophytes*).[6,17,19]Possible causes of the growing predominance of zoophilic dermatophytes are socioeconomic factors and the growing presence of pets in cities. In fact, the most commonly isolated dermatophyte in most cases of tinea capitis in Spain up to the early 21st century was *M canis*,[6–9,17–20,22,27,32–34,39,40]with cats and dogs as the usual source of infection (when identified), often infecting several members of the same family.[14,17,19] *M canis* is still considered to be the most commonly isolated dermatophyte for cases of tinea capitis worldwide,[3] and is certainly so in Europe,[36] most especially in the Mediterranean area (Italy, Croatia, Greece, etc). In most Spanish studies, *T mentagrophytes* (var. *mentagrophytes*) was the second most frequently isolated agent,[1,6,7,9,17,19,32] including in our own series (where it was the most frequent cause of inflammatory tinea capitis)[1]; infection in this case was mainly attributed to contact with rabbits.[17,26,28,39]There now seems to be a new shift underway, back towards the predominance of the anthropophilic tineas in Europe, mainly in urban areas with high immigration (especially from Africa).[17,19,36,41–43] Noteworthy is the increase in tinea capitis cases caused by *T tonsurans* in countries like the United Kingdom,[12,42,44–46] Ireland,[12] and Holland,[47] and in cities like Paris,[19] and also the fact that *T violaceum* was the most frequently isolated dermatophyte in tinea capitis studies performed in Turkey,[48] Rotterdam,[49] and Stockolm.[50] Remarkable also is the growing incidence of infections caused by other anthropophilic dermatophytes, such as *Trichophyton soudanense* (in France, Germany, and Belgium[36,41]) and *Microsporum audouinii* (in France,[51] the United Kingdom,[36] and Belgium[41]).Developments in Spain are following a similar trend. Since the late 20th century, cases of tinea capitis caused by anthropophilic dermatophytes have been on the rise, typically in areas with large immigrant populations.[1,8,30] *T tonsurans*, for example, was isolated as a relatively frequent cause of tinea capitis in a study performed in Madrid,[8] and was, in fact, the most frequently isolated dermatophyte in a prospective study.[30] This agent was also isolated (although less frequently) as a cause of tinea capitis in studies conducted in Malaga,[1] Cadiz,[4] and Santiago de Compostela.[17] *T violaceum*, meanwhile, was also isolated as a very frequent cause of tinea capitis in recent studies conducted in Barcelona[21] and Madrid,[8] and was the anthropophilic dermatophyte most frequently isolated in another study in Malaga.[1] This dermatophyte is closely associated with immigration from North Africa.[52] Recent years have also witnessed a small increase in tinea capitis cases caused by anthropophilic dermatophytes considered rare in our setting, such as

T soudanense (in Santiago de Compostela,[17,34,53] Malaga,[1] Cadiz,[4] Zaragoza,[19] and Madrid[8]) and *M audouinii* (in Madrid[8] and Zaragoza[19]). The increase in anthropophilic infection should be a cause for concern,[36] as it implies increased prevalence of tinea capitis in schools and associated family epidemics.

Clinical presentation of tinea capitis has also changed in line with changes in the pattern of infectious agents. Zoophilic dermatophytes cause microsporum-induced and commonly inflammatory tineas, which typically present with isolated or patchy hairless plaques, with ectothrix invasion in the form of spores outside the hair shaft; anthropophilic agents, on the other hand, typically cause noninflammatory trichophytic tineas, with a black dot pattern, and usually presenting as multiple irregular hairless plaques, with endothrix spore invasion within the hair shaft. Virtually nonexistent in Spain nowadays, but prevalent in the early 20th century was favus, a form of inflammatory tinea capitis characterized by the presence of highly contagious scabs formed of raised yellow cup-shaped crusts (scutula) that encircle the hair follicles. When the agent is anthropophilic, it is also important to screen household contacts for paucisymptomatic or asymptomatic carriers, given the high risk of contagion. This kind of contact, which makes it difficult to eradicate tinea capitis, may, in fact, explain the increase in infections with this etiology in urban areas.[3,30,40,41,54]Diagnostic methods have also advanced with the development of new procedures such as dermoscopy, which highlighted the recently described comma-hair marker.[55] However, it is important to point out that the confirmatory diagnosis for suspected tinea capitis must always be based on a physical examination and culture. Physical examination to determine the kind of hair infestation will indicate the cause of the tinea capitis, and, hence, the specific treatment to follow; the culture will indicate whether the dermatophyte is zoophilic, anthropophilic, or geophilic, and will, in turn, indicate the prophylactic[19] and therapeutic[36] measures to be adopted.Treatment of tinea capitis has also varied over the years. Oral griseofulvin is still the treatment of choice for tinea capitis in children (and the only treatment approved for this population by the Food and Drug Administration),[54,56-59] ever since its effectiveness was documented by Williams and Marten in 1958. The use of griseofulvin led, as we noted previously, to a significant reduction in epidemics; it also led to a decline in treatments hitherto used, including x-ray epilation (as proposed by Sabouraud at the end of the 19th century), thallium acetate, and mechanical epilation. Although the dose and duration of treatment varies depending on the patient,[59,60] griseofulvin (in tablet form) is currently recommended at doses of 25-30 mg/kg daily (up to 1 g daily in adults). Note that, for Spain, where only the micronized formulation is available, the dose indicated in the summary of product characteristics (10–20 mg/kg daily) is generally insufficient, as it corresponds to the dose for the ultramicronized formulation.[56] Treatment duration, usually 6 to 12 weeks, mainly depends on the causative agent.[59] *T tonsurans*, for example, may require a longer treatment period, and there is a growing number of cases of dermatophyte resistance to griseofulvin.[59] An alternative treatment, also recognized as effective, is terbinafine[60-63] (250 mg daily for adults), with the dose adjusted for children by weight (over 40 kg: as for adults; 20-40 kg: half the adult daily dose; under 20 kg: quarter the adult daily dose). Although terbinafine may occasionally be ineffective for tineas caused by *M canis* and *M audouinii*,[16,63] it has fewer drug interactions and may be useful in cases of suspected griseofulvin resistance.[59] Similarly, the duration of treatment varies depending on the infectious agent; 2 to 4 weeks of treatment is recommended for *Trichophyton* infections and 8 to 12 weeks for *Microsporum* infections. To sum up, griseofulvin is recommended as the treatment of choice for suspected microsporum-induced tinea capitis.[56,60] Terbinafine, on the other hand, is recommended for suspected *Trichophyton* infection, and for cases of griseofulvin resistance and polypharmacy, [56,59–61] as it is at least equally effective and safe, usually has a faster mechanism of action, requires a shorter treatment period, and has fewer drug interactions. Second-line drugs, much more costly than griseofulvin, are itraconazole,[54,58,64] ketoconazole,[65] and fluconazole.[56,66] Topical antifungals, proven to be effective in reducing the risks of transmission and of reinfection and in shortening healing time, are useful as adjuvant treatment.[56]In the case of inflammatory tineas, the risk of scarring alopecia is high, so treatment needs to commence immediately. The drugs and doses prescribed above may be used, but some authors also advocate the concomitant use of antiinflammatory agents—usually prednisone at doses of 1 mg/kg daily for 1-2 weeks—applied directly to the lesion in localized processes or taken systemically when involvement is diffuse.[3] Oral antibiotics should only be prescribed if there is secondary bacterial infection.With regard to preventive measures, although recent studies state that there is no need for children (particularly older ones) to stay away from school while receiving treatment,[54,57] this recommendation is controversial,[41] as contact at school is probably the single most important independent factor in the rapid transmission of anthropophilic tineas.As mentioned previously, the possibility of contact with paucisymptomatic or asymptomatic carriers needs to be taken into account, especially with anthropophilic infection, given the high transmission risk.[59] Cultures should be obtained, and the use of antifungal shampoos may be sufficient, even though their efficacy has not been established.[3,9,30,41,67,68] To limit contagion within families due to suspected anthropophilic infection, the importance of not sharing personal hygiene items and of disinfecting the bath or shower after use by possibly infected individuals should be emphasized.[41] Organisms responsible for tinea capitis have been cultivated from fomites such as combs, hats, pillows, and theater seats, where shed spores can survive for long periods of time, thereby helping to spread tinea capitis.[3]

Noteworthy is the relatively high number of tinea capitis cases referred to dermatology departments that have been treated incorrectly or inadequately, especially in recent years.[1,69] This would indicate both a lack of proper treatment guidelines in primary care and a lack of communication with dermatologists; if not properly addressed, these oversights could result in new outbreaks.[1,69]

It is apparent that tinea capitis has been steadily changing in Spain since the 19th century. Since it is not a notifiable disease, its true incidence is unknown.

Yet tinea capitis is considered today to be the most common fungal infection in childhood,[3,29,36,39,51,67,68,70–72] and also a national public health issue, even if not as critical as in other regions of the world, where tinea capitis is endemic and where access to health care is limited.[54,73–77]

Due mainly to migratory flows, it seems likely that the epidemiology of tinea capitis in Spain will continue to change and to become increasingly diverse in terms of etiologic agents. If no efforts are invested to ensure proper diagnosis, treatment, and prevention, tinea capitis prevalence may grow to epidemic proportions in the near future. It is recommended to set up a good surveillance program (especially screening in schools) and ensure interdisciplinary cooperation between dermatologists, pediatricians, primary care physicians, and veterinarians.

Conflicts of Interest

The author declares no conflicts of interest.

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