

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/20277> holds various files of this Leiden University dissertation.

Author: Hogewoning, Arjan

Title: Skin diseases among schoolchildren in Africa

Date: 2012-12-13

Chapter 4

Prevalence and causative fungal species of tinea capitis among schoolchildren in Gabon

Mycoses 54 (5): E354-E359 Sep 2011

Hogewoning AA^{1,2,3}, Adegnika AA^{4,5,6}, Bouwes Bavinck JN³,
Yazdanbakhsh M⁵, Kremsner PG^{4,6}, van der Raaij-Helmer EMH³,
Staats CCG³, Willemze R³, Lavrijsen APM³

¹ Department of Dermatology, University of Ghana Medical School, Korle-Bu Teaching Hospital, Accra, Ghana,

² Department of Dermatology, King Faisal Hospital, Kigali, Rwanda,

³ Department of Dermatology, Leiden University Medical Centre, Leiden, The Netherlands,

⁴ Albert Schweitzer Hospital Lambarene, Gabon,

⁵ Department of Parasitology, Leiden University Medical Centre, Leiden, The Netherlands.

⁶ Institute of Tropical Medicine, University of Tübingen, Tübingen Germany

Summary

Tinea capitis is endemic among schoolchildren in tropical Africa. The objective was to determine the prevalence of symptomatic tinea capitis in schoolchildren in Gabon. A cross-sectional study was conducted with 454 children aged 4 to 17 years, and attending a rural and an urban school. The diagnosis of tinea capitis was based on clinically manifest infection, direct microscopic examination using 20% potassium hydroxide (KOH) solution and fungal culture. Based on clinical examination, 105 (23.1%) out of 454 children had tinea capitis. Seventy-four (16.3%) children were positive by direct examination (KOH) and/or fungal culture. The prevalence of tinea capitis depended on the school studied and ranged from 20.4 % in the urban school with a higher socioeconomic status to 26.3 % in the rural school with lower socioeconomic status. Similarly, the spectrum of causative species varied between the different schools. Taken the schools together, *T. soudanense* (29.4%) was the most prominent species, followed by *T. tonsurans* (27.9%) and *M. audouinii* (25.0%). Clinically manifest tinea capitis is endemic among schoolchildren in the Lambaréné region in Gabon. The prevalence of tinea capitis and the causative species depended on the type of school that was investigated.

Introduction

Superficial fungal infections of the scalp (tinea capitis) are endemic among schoolchildren especially in tropical Africa and they can cause significant public health problems.¹ Tinea capitis is caused by *Trichophyton* and *Microsporum* species.² The most important causative agents are species which are causing an endothrix infection, such as *T. gourvilli*, *T. soudanense*, *T. tonsurans*, *T. violaceum* and *T. yaoundei* and species that cause an ectothrix infection such as *M. audouinii*, *M. canis* and *M. gypseum*.³ The causative agent of tinea capitis varies with geography, socioeconomic status and time.⁴

Although the clinical appearance is variable, late detection and lack of treatment of this disease can result in widespread infections and, in rare cases, permanent alopecia.⁵ More knowledge about the prevalence and causative agents of tinea capitis is necessary to improve control and therapeutic measures.

The objectives of this study were to summarize previous prevalence studies in sub-Saharan African countries and to determine the prevalence of tinea capitis and identify the causative species among schoolchildren in a rural and urban school in Gabon.

Materials and Methods

To collect information about tinea capitis in Gabon, a cross-sectional study was conducted in the Lambaréné Region, comparing a rural school with an urban school (Figure 1). The rural school (Zile school) had a low and the urban school (Lalala school) had a higher socioeconomic status.

The study was carried out from the Albert Schweitzer Hospital which is located about 6 km from the city centre of Lambaréné, Gabon. This city is situated at the riverside of the Ogooué River – one of the largest rivers in Central Africa. Gabon is sparsely populated with an estimated total population of around 1.3 million people in a country of 267,667 km². Most of the territory is covered by dense tropical rainforest. The country has a typical tropical climate with two rainy and two dry seasons and average temperatures between 25.5°C and 27°C. The humidity is constantly high, at about 80%.

In January 2005, 454 schoolchildren from the two schools were fully clinically examined for skin diseases by two dermatologists (A.A.H., A.P.M.L.). Specific attention was focused on clinical signs of fungal infection on the scalp (scaling, hair loss, black dots, chicken skin effect, pustules and scarring alopecia). Samples from scales and hairs were taken by gentle brushing with glass slides and tweezers (Figure 1), and transported at room temperature to the Mycology Laboratory of the Department of Dermatology of the Leiden University Medical Centre in Leiden, the Netherlands. The samples can be kept at room temperature for several months (and probably longer), without affecting the viability of the fungi.⁶

Figure 1 Panel (a) shows schoolchildren in the urban school (Lalala) and panel (b) in the rural school (Zile). Panel (c) shows gentle brushing with glass slides and panel (d) collection of scales with tweezers. Panel (e) shows a non-inflammatory type of tinea capitis with ‘gray-patch’ scaling caused by *M. audouinii* in a 6-year old boy and panel (f) shows tinea capitis caused by *T. soudanense* in a 4-year old boy.



The specimens were examined by direct microscopic examination using 20% potassium hydroxide solution (KOH). For the cultures modified Sabouraud’s dextrose agar with chloramphenicol was used and the specimens were incubated for 28 days at a temperature of 28° degrees Celsius. Species identification was based on growth rate, macroscopic aspect and microscopic examination. Chi-square analyses were used to analyze the different distribution of tinea capitis among boys and girls, different age groups and the different schools.

Results

The figure shows examples of clinical fungal infection on the scalp in the study population. Table 1 provides the baseline characteristics of the 454 schoolchildren who participated in the study. Of the 454 children examined during the survey, a total of 105 (23.1 %) had clinical signs of tinea capitis (Table 1). Direct examination (KOH) was performed in 97 of these 105 children and 1 time in a child without clinical suspicion of

Table 1 Demographic data for tinea capitis among schoolchildren in Gabon.

	N	Positive by physical examination N (%)	Positive by KOH N (%)	Positive by Culture N (%)	Positive by KOH and/or culture N (%)
All children together	454	105 (23.1)	60 (13.2)*	69 (15.2)**	74 (16.3)
Gender					
Male	227	58 (25.6)	35 (15.4)	38 (16.7)	41 (18.1)
Female	227	47 (20.7)	25 (11.0)	31 (13.7)	33 (14.5)
Age (years)					
4-9	262	71 (27.1)#1	43 (16.4)#2	48 (18.3)#3	51 (19.5)#4
10-12	123	24 (19.5)	11 (8.9)	14 (11.4)	15 (12.2)
13-17	69	10 (14.5)	6 (8.7)	7 (10.1)	8 (11.6)
Schools					
Lalala (urban, higher SES***)	245	50 (20.4)	29 (11.8)	30 (12.2)	33 (13.5)
Zile (rural, low SES***)	209	55 (26.3)	31 (14.8)	39 (18.7)	41 (16.9)

SES,socio-economic status.
*There was a clinical suspicion of tinea capitis eight times, but KOH was not performed.
**There was a clinical suspicion of tinea capitis three times, but culture was not performed.
#1p = 0.047, #2p = 0.078, #3 p = 0.102, #4 p = 0.073.

tinea capitis. Culture was performed in 102 children. In total 74 (16.3%) patients were positive for both KOH and / or culture, 60 (13.2%) were positive by KOH and 69 (15.2%) by culture (Table 1).

Tinea capitis was slightly, but statistically non significant, more prevalent among boys compared to girls and in the age group of 4 to 9 years compared to the 13 to 17 years age group (Table 1). The prevalence of tinea capitis did not differ much in the rural school compared to the urban school with a higher socioeconomic status.

The frequency distribution of the different species among the different schools is depicted in Table 2. Combining the data of both schools, the most frequently detected species were *T. soudanense*, *T. tonsurans* and *M. audouinii*. The frequency distribution of the different species was different between the two schools (Table 2). Infections with *T. tonsurans* and *M. audouinii* were more prominent in the rural school while *T. soudanense* was more frequently seen in the urban school.

Table 2 Results of the 102 cultures according to the different schools.

Isolated species*	Schools		Distribution	
	Urban (Lalala)	Rural (Zile)	Total	(%)**
Total number of cultures	50	52	102	
Isolation of fungal species	30	38	68	100.0
<i>T. soudanense</i>	14	6	20	29.4
<i>T. tonsurans</i>	6	13	19	27.9
<i>M. audouinii</i>	4	13	17	25.0
<i>T. violaceum</i>	2	4	6	8.8
<i>T. not determined</i>	1	1	2	2.9
<i>T. rubrum</i>	1	0	1	1.5
<i>M. canis</i>	0	1	1	1.5
<i>T. equinum</i>	1	0	1	1.5
<i>T. mentagrophytes</i>	1	0	1	1.5
Results of other cultures				
Saprophyte	2	2	4	
Bacteria	0	0	0	
Sterile	18	11	29	

*T = Trichophyton; M = Microsporum.
**Frequency distribution among the 68 cultures with isolation of fungal species.

Table 3 summarizes the previous prevalence studies on fungal cultures in schoolchildren carried out in different sub-Saharan African countries and compares those with the present study.^{1,7-15}

Discussion

Our study showed that clinically manifest tinea capitis is endemic among schoolchildren in the Lambaréné region, Gabon. The overall prevalence of clinically manifest tinea capitis was 23% and varied from 20% in the urban school with a high socioeconomic status to 26% in the rural school with lower socioeconomic status. The slightly higher prevalence of tinea capitis in the rural school might be explained by a lower availability of antifungal treatments, poor hygienic conditions, or school and household over-crowding. A same pattern was observed in our study in the Greater Accra region in Ghana.¹⁰

In our studies we did not test for minimal infection, termed carrier state, i.e. we did not collect samples from all children. We, therefore, may have missed some children with asymptomatic dermatophyte scalp carriage so that the real prevalence of tinea capitis may even be higher. Anthropophilic dermatophytes (i.e. *T. tonsurans* and *T. violaceum*) have been generally associated with high rates of asymptomatic carriage.¹⁶ Like in other studies performed in the region *T. soudanense* appeared to be one of the most frequent causative agents.^{2,11,17-19} The percentage of *T. violaceum* (8.8%) was much lower than recent figures found in South Africa (90%),²⁰ Ghana (26%),¹⁰ Ethiopia and Rwanda (42%),^{21,22} although in a study in Mozambique also very few cases of *T. violaceum* were found.¹⁵ These prevalences are different compared to those provided in an excellent review dating from 1974, in which *T. violaceum* was more prevalent in Northern and Eastern Africa (25% or more frequent).¹⁹ Changes in geographical distribution over time may be related to increasing mobility of the population. The percentage of *M. audouinii* (25%) was comparable to other studies performed in Africa.^{1,9,11,13,15,22} In other studies from Nigeria and Ghana *M. ferrugineum* was present in a high percentage (between 7.7-17.3%),^{1,7,10} while in the present study this species was not found. The percentages of infections with both *T. tonsurans* and *M. audouinii* were high (27.9% and 25.0%). There does not appear to be a replacement of *M. audouinii* by *T. tonsurans* as has been seen in the past half century in the United States which might have been caused by the success of griseofulvin treatment on the US mainland.²⁰

The prevalence of tinea capitis was highest among boys in the younger age group (4-9 years) as reported in earlier studies,^{1,2,11,17} although in our study statistical significance was not reached. The spectrum of fungal species varied considerably between the schools. In the rural school with a lower socioeconomic status the percentage of *M. audouinii* was higher and the percentage of *T. soudanense* lower than the urban school

Table 3 Summary of cross sectional studies on tinea capitis in school children carried out in sub-Saharan African countries

Study description				Eastern / Southern Africa			Western Africa					
First author	Ayaya	Robertson	Sidat	Menan	Oyeka	Enweani	Nweze	Emele	Ayanbimpe	Hogewoning	Current study	
Country ^{reference}	Kenya ⁸	Zimbabwe ¹⁴	Mozambique ¹⁵	Ivory Coast ¹¹	Nigeria ¹³	Nigeria ⁹	Nigeria ¹²	Nigeria ¹	Nigeria ⁷	Ghana ¹⁰	Gabon	
Year(s) of study	2001	1990	2001	1998-99	1984	1996	1997-98	2002-2005	2004	2004	2005	
Number of children	68	704	685	1913	1555	1400	2193	47723	28505	463	454	
Age (years)	6 to 14	5 to 9	4 to 15	4 to 15	4 to 18		4 to 16	2 to 15	3 to 16	5 to 17	4 to 17	
Prevalence tinea capitis												
Clinical positive	33.3%	202 (29.0%)	67 (9.8%)	227 (11.8%)	300 (19.3%)		4498 (9.4%)		796 (2.8%)	39 (8.4%)	105 (23.1%)	
KOH positive		149 (21.2%)		211 (11.0%)					27 (5.8%)	60 (13.2%)		
Culture positive		140 (19.9%)	67 (9.8%)	217 (11.3%)	158 (10.2%)	188 (13.4%)	502 (1.1%)		27 (5.8%)	69 (15.2%)		
KOH and/or culture positive		174 (24.5%)	67 (9.8%)	220 (11.5%)		154 (7.0%)	502 (1.1%)		248 (0.9%)	31 (6.7%)	74 (16.3%)	
Mycological results												
Trichophyton												
T. concentricum												
T. ferrugineum												
T. interdigitale												
T. mentagrophytes												

T. Trichophyton ; M. Microsporon ; F. Fusarium .

¹T. rubrum and T. soudanense are now considered the same species.

²M. audouinii and M. langeronii are also considered the same species. Some percentages add up to more than 100% because of double infections.

with a higher socioeconomic status, a pattern seen before in Ghana and Nigeria.^{7,10} It should be noted, however, that prevalence data of studies performed in one area of the country cannot be generalized to the entire country.^{2,7}

Different clinical presentations of tinea capitis were sparse, most children presented with a non-inflammatory type of tinea capitis especially 'gray-patch' scaling alopecia, seborrheic-dermatitis like scales and patches of 'black dot' and 'chicken skin' alopecia. We only saw one child with a kerion, an inflammatory form of tinea capitis, which can result in alopecia with scarring.

In Conclusion, our study showed that tinea capitis is endemic among schoolchildren in the Lambaréné region in Gabon and that the prevalence to a certain extent depended on the location and the socio-economic status of the school that was investigated. In addition, there were important varieties in the causative species described between the different schools in our study group and the causative species were different compared to studies conducted in other African countries.

References

1. Emele FE, Oyeka CA. Tinea capitis among primary school children in Anambra state of Nigeria. *Mycoses* 2008; **51**: 536-41.
2. Ngwogu AC, Otokunefor TV. Epidemiology of dermatophytoses in a rural community in Eastern Nigeria and review of literature from Africa. *Mycopathologia* 2007; **164**: 149-58.
3. Elewski BE. Tinea capitis: a current perspective. *J Am Acad Dermatol* 2000; **42**: 1-20.
4. Jahangir M, Hussain I, Khurshid K, Haroon TS. A clinico-etiological correlation in tinea capitis. *Int J Dermatol* 1999; **38**: 275-8.
5. Gargoom AM, Elyazachi MB, Al Ani SM, Duweb GA. Tinea capitis in Benghazi, Libya. *Int J Dermatol* 2000; **39**: 263-5.
6. Sinski JT, Moore TM, Kelly LM. Effect of Moderately Elevated-Temperatures on Dermatophyte Survival in Clinical and Laboratory-Infected-Specimens. *Mycopathologia* 1980; **71**: 31-5.
7. Ayanbimpe GM, Taghir H, Diya A, Wapwera S. Tinea capitis among primary school children in some parts of central Nigeria. *Mycoses* 2008; **51**: 336-40.
8. Ayaya SO, Kamar KK, Kakai R. Aetiology of tinea capitis in school children. *East Afr Med J* 2001; **78**: 531-5.
9. Enweani IB, Ozan CC, Agbonlahor DE, Ndip RN. Dermatophytosis in schoolchildren in Ekpoma, Nigeria. *Mycoses* 1996; **39**: 303-5.
10. Hogewoning AA, Duijvestein M, Boakye D *et al*. Prevalence of symptomatic tinea capitis and associated causative organisms in the Greater Accra Region, Ghana. *British Journal of Dermatology* 2006; **154**: 784-6.
11. Menan EI, Zongo-Bonou O, Rouet F *et al*. Tinea capitis in schoolchildren from Ivory Coast (western Africa). A 1998-1999 cross-sectional study. *Int J Dermatol* 2002; **41**: 204-7.
12. Nweze EI. Etiology of dermatophytoses amongst children in northeastern Nigeria. *Med Mycol* 2001; **39**: 181-4.
13. Oyeka CA. Tinea capitis in Awka local government area of Anambra State. *West Afr J Med* 1990; **9**: 120-3.
14. Robertson VJ, Wright S. A survey of tinea capitis in primary school children in Harare, Zimbabwe. *J Trop Med Hyg* 1990; **93**: 419-22.
15. Sidat MM, Correia D, Buene TP. Tinea capitis among rural school children of the district of Magude, in Maputo province, Mozambique. *Mycoses* 2006; **49**: 480-3.
16. Ilkit M, Demirhindi H. Asymptomatic dermatophyte scalp carriage: laboratory diagnosis, epidemiology and management. *Mycopathologia* 2008; **165**: 61-71.
17. Adou-Bryn KD, Assoumou A, Haddad RN, Aka BR, Ouon J. [Epidemiology of tinea capitis in Abidjan, Cote d'Ivoire]. *Med Trop (Mars)* 2004; **64**: 171-5.
18. Dupouy-Camet J, Tourte-Schaefer C, Viguie C, Nicolle L, Heyer F, Lapierre J. [Epidemiology of tinea of the scalp in Togo]. *Bull Soc Pathol Exot Filiales* 1988; **81**: 299-310.
19. Verhagen AR. Distribution of Dermatophytes Causing Tinea Capitis in Africa. *Tropical and Geographical Medicine* 1974; **26**: 101-20.
20. Morar N, Dlova NC, Gupta AK, Aboobaker J. Tinea capitis in Kwa-Zulu Natal, South Africa. *Pediatr Dermatol* 2004; **21**: 444-7.
21. Woldeamanuel Y, Leekassa R, Chryssanthou E, Menghistu Y, Petrini B. Prevalence of tinea capitis in Ethiopian schoolchildren. *Mycoses* 2005; **48**: 137-41.
22. Bugingo G. [Causal agents of tinea of the scalp in the region of Butare (Rwanda)]. *Ann Soc Belg Med Trop* 1993; **73**: 67-9.