

Tinea capitis among primary school children in some parts of central Nigeria

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Summary

Tinea capitis is the most common superficial mycosis in children of school age. Although it is of public health importance, it is not a reportable or notifiable disease; therefore, actual prevalence figures are unknown in many endemic areas. The aim of this work was to determine the prevalence of tinea capitis among primary school children in two states in central Nigeria, highlighting the main aetiological agents of the infection and possible predisposing factors. A total of 28 505 primary school children aged between 3 and 16 years were recruited for the study, from 12 primary schools in two local government areas of Benue and Plateau States of Nigeria. Of them, 796 had lesions, which were clinically suggestive of tinea capitis out of which 248 (31.2%) were confirmed positive by microscopy and culture. Tinea capitis was more frequent in males, 194 (78.2%) than in females, 54 (21.8%). Children aged 10–14 years, followed by 5–9 years were predominantly infected, with 106 (42.7%) and 100 (40.3%) respectively. There was a significant correlation between age group and occurrence of tinea capitis in the study population at 95% confidence level ($P = 0.004$). Tinea capitis was significantly more frequent in Jos State (44.6%) than in Gboko State (23.2%) ($t = .659$; 95% confidence level). The prevalence of tinea capitis was influenced by social and cultural habits of the areas rather than by population density. The aetiological agent of tinea capitis in the study population was *Trichophyton soudanense*, 76 (30.6%), followed by *Microsporum ferrugineum*, 19 (7.7%) and *Microsporum audouinii*, 19 (7.7%). Differences in aetiology were observed for Gboko and Jos, except for *T. soudanense*, which predominated in both areas. The high prevalence of tinea capitis in the areas studied may be attributed to frequent interaction with soil and animals and low level of health education on personal and environmental hygiene. Aetiological agents varied from one geographical area to another.

Key words: Tinea capitis, Gboko, Jos, *Trichophyton soudanense*, school children.

Introduction

Ringworm infection of the scalp, referred to as tinea capitis, is a common childhood infection, particularly among children of primary school age. It is the most common fungal infection among children of school age and is increasingly of public health importance.^{1,2} The

disease had reached epidemic proportions in some parts of the world.^{2,3} Tinea capitis is a highly contagious disease widely distributed throughout the world, but more prevalent in hot humid tropical climates than in cold dry regions.⁴ The incidence of the disease is influenced by various factors such as race, socio-economic conditions, cultural patterns and public health measures.^{1–7} The high incidence was attributed to low levels of fungistatic fatty acids in these children,⁴ frequent contact at school and at play and exposure to domestic animals and pets.^{7,9} Increasing incidence of the infection may not be unrelated to the reported increase in asymptomatic carriers among adults.²

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Incidence of tinea capitis in children may vary with respect to age and causative dermatophyte. Males are more commonly affected, with rates two to five times higher than in females.^{5,8,10–12} The aetiological agents of tinea capitis vary from one geographical location to another. In Sub-Saharan West Africa, *Microsporum audouinii* and *Trichophyton soudanense* are predominant^{4,6,7}; in the Western regions of the world, *Trichophyton tonsurans* has emerged the predominant cause of tinea capitis^{1,2,4,11,12}; *Trichophyton violaceum* in North Africa and Asia.^{4,5,13,14} Even within the same country, variations have been observed.^{9,15}

Although tinea capitis, like other dermatophytoses, is of public health importance, it is not a notifiable disease and as a result, the actual prevalence figures are unknown in many endemic areas.^{7,9,10} A shift in aetiology has frequently been observed and thus the need for constant surveillance to determine the epidemiological trends of the disease in various parts of the country. There are no documented reports on tinea capitis among primary school children in these parts of the country, hence this investigation.

Material and methods

The investigation was carried out from September to December 2004 in Gboko and Jos North local government areas of Benue and Plateau States of Nigeria respectively. A total of 28 505 pupils from 12 primary schools, labelled from A to F, and A¹ to F¹ for Jos and Gboko, respectively, were examined. Written permission was obtained from the local school board before the sampling commenced. The schools from the regions were classified into areas of high density, (these are inhabited mostly by low income earners) and areas of low density (inhabited mostly by high income earners). Pupils were physically examined for suggestive scalp lesions. Specimens were obtained from 796 of them, 570 males and 226 females. Data on age, barbing mode, extracurricular activity and cultural habits were obtained from these. Hairy areas were properly shaved with a pair of scissors. Lesions were thoroughly cleaned with 70% alcohol. Using sterile scalpel blades, the affected areas were scraped into sterile disposable dishes (Eiken Kizal Co. Ltd, Japan) and taken to the laboratory for analysis.

Direct microscopic examination

A portion of each specimen was placed on a drop of 15% potassium hydroxide solution on a clean glass slide, a cover slip placed over it and viewed under the microscope.

Culture

A portion of each specimen was inoculated onto slants of Sabouraud's dextrose agar (Fluka Biochemika, Steinheim, Germany) supplemented with cycloheximide (0.5 g l⁻¹) (Fluka Biochemika) and chloramphenicol (0.05 g l⁻¹). The culture tubes were incubated at room temperature (26–30 °C) for 1–8 weeks, observed regularly for growth.

The isolates were identified by mounting a portion of the growth in lactophenol cotton blue on a microscope slide and viewing under the microscope. Isolates were identified based on macroscopic and microscopic features compared with standard descriptions in Mycological laboratory texts and manuals.^{17,18}

Results

Of the 28 505 pupils examined, 796 (2.8%) had scalp lesions; 248 (31.2%) of the lesions yielded fungi (Table 1). The age group predominantly infected was 10–14 years (42.7%) followed by 5–9 years (40.3%). More males (78.2%) were infected than females (21.8%). Table 2 shows details of occurrence of tinea capitis with respect to age group and sex. The prevalence of tinea capitis infection was higher in Jos (44.6%) than in Gboko (23.2%) ($t = 0.659$; 95% confidence level). There was a significant difference in occurrence of tinea capitis with respect to locality of the various schools ($P \geq 0.05$) (Table 3). High population density did not favour prevalence of the infection, as less populous schools had higher rates of infection. Schools

Table 1 Occurrence of tinea capitis in Gboko and Jos North Local Government areas

Location	No. examined	No. with lesions	No positive	Percentage
Gboko	14 000	500	116	23.2
Jos	14 505	296	132	44.6
Total	28 505	796	248	31.2

Table 2 Age and sex distribution of tinea capitis in the population

Age group (years)	No. sampled			No. infected		Total infected (%)
	Male (%)	Female (%)	Total	Male	Female	
0–4	66	40	106	15 (14.2)	9 (8.5)	24 (9.7)
5–9	156	74	230	63 (27)	37 (16.1)	100 (40.3)
10–14	262	25	287	102 (35.5)	4 (1.4)	106 (42.7)
15–19	120	53	173	14 (8.1)	4 (1.4)	18 (7.3)
Total	604	192	796	194 (78.2)	54 (21.8)	248 (31.2)

Jos north local government area				Gboko local government area			
School	Population	No. with lesions	No. +ve (%)	School	Population	No. With lesions	No. +ve (%)
School A	1717	17	10 (58.8)	School A ¹	1700	94	31 (32.9)
School B	1850	45	34 (44.4)	School B ¹	1830	50	8 (16.0)
School C	2248	34	11 (32.3)	School C ¹	2058	62	12 (19.4)
School D	2530	64	31 (48.4)	School D ¹	2300	80	17 (21.3)
School E	2960	66	21 (31.7)	School E ¹	3050	110	26 (23.6)
School F	3200	70	25 (35.7)	School F ¹	3062	104	22 (21.2)
Total (%)	14505	296	132 (44.6)	Total (%)	14 000	500	116 (23.2)

¹Schools in Gboko of similar status with those in Jos.

Aetiological agent	No. isolated, Gboko	No. isolated, Jos North	Total	Percentage
<i>Trichophyton soudanense</i>	23	53	76	30.6
<i>Trichophyton mentagrophytes</i>	16	2	18	7.3
<i>Trichophyton tonsurans</i>	7	11	18	7.3
<i>Microsporum audouinii</i>	2	17	19	7.7
<i>Microsporum nanum</i>	15	0	15	6.0
<i>Acremonium sp</i>	3	0	3	1.2
<i>Trichophyton violaceum</i>	3	13	16	6.5
<i>Trichophyton rubrum</i>	0	13	13	5.2
<i>Microsporum canis</i>	17	1	18	7.3
<i>Trichophyton schoenleinii</i>	1	3	4	1.6
<i>Microsporum gypseum</i>	17	0	17	6.9
<i>Microsporum ferrugineum</i>	0	19	19	7.7
<i>Trichophyton terrestre</i>	12	0	12	4.8
Total	116	132	248	100.0

Table 3 Prevalence of tinea capitis in school children with respect to locality and population density

Table 4 Prevalent aetiological agents of tinea capitis in the population

in more commercial areas recorded higher infection rates.

Two-hundred-and-forty-eight isolates made up of 13 species were found (Table 4). *T. soudanense* predominated, 76 (30.6%), followed by *Microsporum ferrugineum*, 19 (7.7%) and *M. audouinii*, 19 (7.7%). *Acremonium recifei* was isolated from three (1.2%) of the pupils.

A considerable number of pupils presented with scalp lesions were characterized by dry, flat and wide patches with complete hair loss (alopecia). Most of the *T. soudanense* infected scalp lesions were many, white, dry and scaly. Also observed was the close resemblance of the lesions caused by *Acremonium* to that caused by dermatophytes.

Discussion

Tinea capitis among primary school children in parts of Benue and Plateau states of Nigeria was established. This study actually constitutes the first among primary school children in Benue State. The study corroborates reports from various parts of the world on the high

incidence of tinea capitis among primary school children.¹⁻⁸ A higher prevalence in males was observed, similar to several other reports from various countries of the world.^{1-5,8-10} One such report⁸ even puts the male : female ratio at 5 : 1, particularly for tinea capitis caused by *M. audouinii*.

One would have expected a higher rate of infection for Gboko, which has higher temperature and relative humidity but this was not so. Jos North and Gboko fall within the same guinea savannah vegetation but their altitudes vary and thus the difference in temperature. Jos North has relatively lower temperature than Gboko and yet has a higher prevalence of tinea capitis. Jos is a more urbanized area with higher commercial activities than Gboko. This seemed to have influenced the prevalence of infection among the children. Schools in higher density areas had higher rates of infection. The population of the individual schools did not, however, enhance prevalence of tinea capitis. Less populous schools recorded higher infection rates. This is a deviation from the reports on the effect of overcrowding on the prevalence of dermatophytoses.^{5,7}

The age group with the highest rate of infection was 10–14 years, followed by 5–9 years. These age groups have been prominent in earlier reports.^{2,5,7} They constitute the most active in the population especially at play grounds, hence their closer contact with sources of fungal pathogens. Most children at this age group are left to cater for themselves in terms of bathing and cleaning themselves; and generally, they are completely ignorant about methods of prevention and control of fungal infections.

The aetiological agents of tinea capitis varied for Gboko and Jos. Zoophilic and geophilic species of dermatophytes were prevalent in Gboko, unlike Jos where most of the isolates were anthropophilic. Children in Gboko helped their parents on the farms as well as caring for livestock and domestic animals around their homes. Commercial activities in Jos, being a state capital, which brings people from various parts of the state and other parts of the country, may enhance exposure of the children directly or indirectly through older family members, to infection. A large proportion of the children barbed in public barbing salons and there is possibility of acquiring infection from infected individuals. Other reports have attributed the increasing incidence of tinea capitis in children to the increasing carrier rates in the adult population.^{2,5,16} The shift in aetiological agents from one geographical area to another was further established. From this study, it could be observed that even regions which fall within the same geographical area, like Jos North and Gboko, had different agents of tinea capitis. *Trichophyton soudanense* has been reported to predominate in most of Sub-Saharan West Africa,^{4,6,7} and that was our finding in this study in both Benue and Plateau states (although in some parts of Southern Nigeria *Trichophyton mentagrophytes* predominates).¹⁵ *Microsporum ferrugineum* and *M. audouinii* were next to *T. soudanense* in occurrence (7.7%), most of which were isolated from children in Jos. This high rate of occurrence is remarkable, considering the rare reports on *M. ferrugineum* in Nigeria. Where it has been reported, the rates were not as high.²⁰ *Microsporum ferrugineum* was not isolated from Gboko, which is an agricultural community, probably because it is an anthropophilic species transmitted mainly from human to human. The occurrence of *Acremonium recifei* in three of the subjects is remarkable, as this organism is scarcely reported as a cause of scalp infection. The lesions were so similar to that caused by dermatophytes that, except for cultural isolation, the diagnosis would have been easily missed. The routine culture of specimens should be encouraged to ascertain the actual causative agent of fungal

infections. This will also help in the right choice of chemotherapy, bearing in mind that some fungi, for example, *Fusarium* spp., closely related to *Acremonium*, are resistant to some commonly used antifungal drugs.¹⁹ The three isolates of *Acremonium* were obtained from Gboko. *Acremonium* is a fungus isolated from plant debris and soil. Gboko is a rural area where majority are farmers and this brings the children into closer contact with the organism.

The high prevalence of tinea capitis in school children in the areas studied raises important needs for public awareness of the modes of spread and simple preventive measures. Intensifying health education and enforcing proper hygienic practices among school children will contribute to some extent in reducing the current trend in schools and by extension, the larger population.

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