

Tinea Capitis And Pityriasis Versicolor Infections Among School Children In The South-Eastern Nigeria: The Public Health Implications

C Uneke, B Ngwu, O Egemba

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Abstract

A survey of Tinea capitis (TC) and Pityriasis versicolor (PV) was conducted among school children in Abakaliki, south eastern Nigeria using standard mycological techniques. Of the 500 children studied (290 males, 210 females; aged 7-17years), 312 were clinically diagnosed but mycological examination showed dermatophytes in 259 specimens, a TC prevalence of 51.8% (95% CI., 47.4-56.2%), and Malassezia species in 23 specimens, a PV prevalence of 4.6% (95% CI., 2.8-6.4%). Boys were significantly more infected with TC than girls (61.0%, 95% CI., 55.4-66.6% vs 39.0%, 95% CI., 32.4-45.6%) ($\chi^2=23.62$, $df=1$, $P<0.05$) and children 9 years old and less, were significantly more infected (60.0%, 95% CI., 50.4-69.6%) ($\chi^2=12.98$, $df=2$, $P<0.05$). Girls were significantly more infected with PV (8.1%, 95% CI., 4.4-11.8%) than boys (2.1%, 95% CI., 0.4-3.8%) ($\chi^2=9.96$, $df=1$, $P<0.05$) and highest prevalence was among children 14-17years old (9.3%, 95% CI., 5.0-13.4). The rates of TC and PV increased with increase in the number of occupants per bedroom.

INTRODUCTION

Dermatological problems manifesting as primary and secondary cutaneous complaints, constitute at least 30% of all outpatient visits to a paediatrician and 30% of all visits to dermatologists involve patients of paediatric age group (1). In paediatric dermatology, fungal infections of the skin and scalp represent a relatively common problem especially in the tropical and subtropical regions of the world where the warm and humid climates provide a favourable environment for organisms causing superficial mycoses (2). Tinea capitis the scalp ringworm caused by dermatophyte moulds and Pityriasis versicolor which is localised to the stratum corneum of the skin and caused by Malassezia species are very important superficial mycoses that are chronic and recurring conditions in children (3,4).

Tinea capitis caused by fungi of species of genera Trichophyton and Microsporum, varies from a scaly noninflamed dermatosis resembling seborrheic dermatitis to an inflammatory disease with scaly erythematous lesions and hair loss or alopecia that may progress to severely inflamed deep abscesses termed kerion, with the potential for scarring and permanent alopecia (5). Dermatophytic fungi causing Tinea capitis can be divided into anthropophilic and zoophilic organisms. Anthropophilic fungi grow

preferentially on humans, and the most common type forms large conidia of approximately 3-4 μm in diameter within the hair shaft and are transmitted by contact with infected persons or their fomites such as combs, brushes, or headgears (4,5). Zoophilic fungi are acquired through direct contact with infected animals, they form smaller conidia of approximately 1-3 μm in diameter typically extending around the exterior of the hair shaft and are transmitted by contact with infected pets or animals such as cats, dogs or cattle (5,6).

Pityriasis versicolor is most prevalent in the tropics and is a benign, superficial fungal infection and occurs from using infected clothes, towels and bed sheets, with autoinfection being a common occurrence (2,3). It is usually characterized by hypopigmented or hyperpigmented macules and patches on the chest and the back and in patients with a predisposition, the condition may chronically recur (7). The causative agents of genus Malassezia are members of normal human cutaneous flora, and it is found in 18% of infants and 90-100% of adults (7). In patients with clinical disease, the organism is found in both the yeast (spore) stage and the filamentous (hyphal) form and the factors that lead to the conversion of the saprophytic yeast to the parasitic, mycelial morphologic form include a genetic predisposition; warm, humid environments; immunosuppression; malnutrition; and

Cushing disease (8,9).

Superficial mycoses have neither been the focus of intensive study nor of active control programs in the sub-Saharan Africa, including Nigeria, and this neglect is likely because fungal diseases of healthy humans tend to be relatively benign (2). Consequently, there is paucity of information on the epidemiology of superficial mycoses in Nigeria and this dearth of scientific information has affected adequate patient management, diagnosis, control programmes and identification of fungal drug resistance. Despite the socio-economical improvement in many parts of Nigeria and the efficacy of available antifungal treatment, superficial mycoses remain a common condition in dermatologic practice in the country. In this report we present the findings of a cross-sectional study of the prevalence of *Tinea capitis* and *Pityriasis versicolor* among school children in the south-eastern Nigeria. The public health significance of results and the implications for superficial mycoses control are discussed as they affect primary health care delivery in Nigeria and other parts of the sub-Saharan Africa with similar setting.

MATERIALS AND METHODS

STUDY AREA

The study was conducted from January 2005 to June 2005 at Abakaliki, the capital city of Ebonyi State, south-eastern Nigeria, among primary and secondary school children. The area lies approximately between longitude 8°6'6" E and latitude 6°22'26" N and is located on the lower belt of the Niger. The average atmospheric temperature of the area is 31°C with vegetation that is a mixture of Savannah and semi-tropical forest. There are two distinct seasons; the wet and the dry seasons. The former occurs between April and October, while the latter takes place from November to March. A systematic school-based epidemiological study of superficial fungal infection has not been conducted in the area.

ETHICAL ISSUES

Approval of this study was obtained from the Infectious Disease Research Division (IDRD), Department of Medical Microbiology, Faculty Clinical Medicine, Ebonyi State University Abakaliki. Approval was also obtained from the Boards and Managements of the selected schools as well as from the Parents Teachers Association (PTA) of the schools. The approval was on the agreement that participants anonymity must be maintained, good laboratory

practice/quality control ensured, and that every finding would be treated with utmost confidentiality and for the purpose of this research only.

STUDY POPULATION

The study was an anonymous, unlinked, cross-sectional survey and following informed consent 500 school children were enrolled. Three primary schools and two secondary schools were used for the study. Participants were randomly selected from all the grades (Classes 1-6) of the selected primary schools but only individuals from the junior classes consented to participate in the secondary schools. All the schools used for this study were public schools with crowded classrooms and inadequate facilities. Majority of the children hailed from low income socio-economic class. The children were compensated writing materials (exercise books, pencils, pens, rulers, erasers, sharpeners) for their participation in the study.

EXAMINATION OF PARTICIPANTS/ SAMPLING TECHNIQUE

Physical examination of participants was conducted to identify features suggestive of *Tinea capitis* and *Pityriasis versicolor*. The examination took place at the sick-bay of the selected schools. The sex of each child was recorded while age and number of occupants per bedroom in each child's home, were obtained by interview. All the children irrespective of gender wore short hair (much shorter among the boys) which was in line with the regulation of the schools. To maximize the sense of comfort, female participants were examined by the female member of the research team.

The skin of scalp, eyebrows, and eyelashes of each child was carefully examined for characteristic features of *Tinea capitis* as described previously (5,10). These included (i) lesions manifesting as red papules to grayish ring-formed patches containing perifollicular papules, (ii) pustules with inflamed crusts, exudate, matted hairs, and debris, (iii) black dot with fracture of the hair, leaving the dark stubs visible in the follicular orifices and, (iv) kerion celsi manifesting as a patchy or diffuse distribution and severe hair loss with scarring alopecia.

The trunk shoulders, upper neck, upper limbs, trunk, the back, the abdomen, and the proximal extremities of each child were also examined for *Pityriasis versicolor* features as described previously (7,9). The features sought included; erythematous scaly macules and patches, hyperpigmented

patches intermingled with hypopigmented areas on the affected site, an almost white to reddish brown lesion with a fine, dustlike scale covering the lesions.

Affected areas were cleansed with 70% v/v ethanol and light scrapings (skin scales, crusts, hair pieces) were taken from the active edge of lesion using a blunt sterile scalpel blade (12). The scrapings were collected in coded brown envelopes and taken to the Medical Microbiology Laboratory of Ebonyi State University Abakaliki, for mycological analysis.

LABORATORY ANALYSIS

Mycological analysis of specimens was performed as described previously (11). Briefly; each specimen was placed on a slide and a drop of 20 percent potassium hydroxide was added and covered by a cover slip. This was heated gently in order to soften and clear the material and then specimen was examined with low power microscope.

Diagnosis of dermatophytes in the skin scales and crusts was predicted on visualization through direct microscopy of branching septate hyphae with angular or spherical arthroconidia (arthrospores), usually in chains.

Dermatophytes diagnosis in the hair pieces was predicted on visualization of anthroconidia arranged along the length of the hair in chains or in masses around the hair (ectothrix infection) or in the hair substance (endothrix infection) (11).

Pityriasis versicolor infection was defined by the visualization of clusters of round or oval thick-walled budding yeast cells, and abundant short curved septate hyphae (pseudo-hyphae) of various sizes and shapes, on the addition of 20% blue-black ink (11).

Infected children were referred to Abakaliki Local Government Health Clinic for medical attention.

STATISTICAL ANALYSIS

Differences in proportion were evaluated using the Chi-square test. Statistical significance was achieved if P < 0.05.

RESULTS

Of the 500 children studied (290 males, 210 females; aged 7-17years), 312 were clinically diagnosed, showing evidence of either Tinea capitis or Pityriasis versicolor. Mycological examination of the scalp scrapings showed the presence of dermatophytes in 259 specimens, indicating a Tinea capitis prevalence of 51.8% (95% CI., 47.4-56.2%), while the mycological examination of skin scrapings showed Malassezia species in 23 specimens, a Pityriasis versicolor

prevalence of 4.6% (95% CI., 2.8-6.4%).

The males were more infected with Tinea capitis than the females (61.0%, 95% CI., 55.4-66.6% vs 39.0%, 95% CI., 32.4-45.6%) and the difference was statistically significant ($\chi^2=23.62$, df=1, P<0.05) (Table 1). The prevalence of Tinea capitis increased with age and children who were 9years old and less, were significantly more infected (60.0%, 95% CI., 50.4-69.6%) than those 10-13years old (57.4%, 95% CI., 50.8-64.0%) and 14-17years old (40.8% 95% CI., 34.0-47.9%) ($\chi^2=12.98$, df=2, P<0.05) (Table 1). The number of occupants per bedroom was associated with Tinea capitis and result showed the highest prevalence among children who admitted having more than six occupants in their bedrooms (56.3%, 95% CI., 48.9-56.2%) (Table 1), although the difference was not statistically significant ($\chi^2=2.79$, df=2, P <0.05).

Figure 1

Table 1: Prevalence of Tinea capitis and Pityriasis versicolor among school children in the south-eastern Nigeria.

Parameter	Tinea capitis			Tinea versicolor	
	No. examined	No.(%) infected	95% Confidence interval	No.(%) infected	95% interval
Sex					
Male	290	177(61.0)	55.4-66.6	6(2.1)	0.4-3.8
Female	210	82(39.0)	32.4-45.6	17(8.1)	4.4-11.8
Total	500	259(51.8)	47.4-56.2	23(4.6)	2.8-6.4
Age					
≤9	100	60 (60.0)	50.4-69.6	0(0.0)	--
10-13	216	124(57.4)	50.8-64.0	6(2.8)	0.6-5.0
14-17	184	75(40.8)	34.0-47.9	17(9.2)	5.0-13.4
Total	500	259(51.8)	47.4-56.2	23(4.6)	2.8-6.4
Number of occupants/bedroom					
≤3	154	70(45.5)	37.6-53.4	5(3.2)	0.4-6.0
4-6	172	91(52.9)	45.4-60.4	8(4.6)	1.5-7.7
>6	174	98(56.3)	48.9-56.2	10(5.7)	2.3-9.1
Total	500	259(51.8)	47.4-56.2	23(4.6)	2.8-6.4

The prevalence of Pityriasis versicolor was significantly higher in the females (8.1%, 95% CI., 4.4-11.8%) than the males (2.1%, 95% CI., 0.4-3.8%) ($\chi^2=9.96$, df=1, P<0.05) (Table 1). The highest prevalence of Pityriasis versicolor was recorded among children 14-17years old (9.3%, 95% CI., 5.0-13.4%), followed by the 10-13 years age category (2.8%, 95% CI., 0.6-5.0%). No case of the infection was recorded among children who were 9years old and less (Table 1). Chi-square test indicated a significant difference in the association between Pityriasis versicolor and age ($\chi^2=15.34$, df=2, P<0.05). The prevalence of Pityriasis versicolor was highest among children who were more than six occupants in their bedrooms (5.7%, 95% CI., 2.3-9.1%) (Table 1), although no statistically significant difference was observed ($\chi^2=1.39$, df=2, P <0.05).

DISCUSSION

The results of this investigation indicate that superficial fungal infections, especially caused by dermatophytes, represent a relatively common problem among children of school age in south-eastern Nigeria. The prevalence of *Tinea capitis* (51.8%) was higher than *Pityriasis versicolor* (4.6%) among the children and this is similar to the outcome of studies on superficial mycoses in Ibadan Nigeria (*Tinea capitis*, 15.2%; *Pityriasis versicolor*, 4.7%)⁽¹²⁾, and in Qatif, Saudi Arabia (*Tinea capitis*, 47.7%; *Pityriasis versicolor*, 25.8%)⁽¹³⁾, among children. *Tinea capitis* has been described as the most common pediatric dermatophyte infection worldwide⁽⁴⁾, which was confirmed by the high prevalence of the infection observed in this study. The relatively lower prevalence of *Pityriasis versicolor* in this study confirmed previous reports which indicated that the infection is unusual in children⁽⁹⁾. Although fungal infections of the skin were less common among the children, the relatively very common fungal infections of the scalp indicate the need for early diagnosis because they may result in destruction of hair and pilosebaceous structures with severe hair loss and scarring alopecia if left untreated⁽³⁾.

The *Tinea capitis* infection prevalence of 51.8% observed in this study was comparatively higher than those recorded among school children in many parts of the world including, Antsirabe, Madagascar (20.5%)⁽¹⁴⁾, Barcelona, Spain (0.23%)⁽¹⁵⁾, Eldoret, Kenya (33.3%)⁽¹⁶⁾, Tikrit, Iraq (2.7%)⁽¹⁷⁾, and Nablus, Palestine (1.0%)⁽¹⁸⁾. Despite the benign curable nature of the disease, the high rate of *Tinea capitis* in this investigation probably indicated that interhuman transmission of *Tinea capitis* is very efficient among the school children and could constitute a considerable public health problem due to the increasing number of children affected and the risk of contagion in schools, facilitated by the overcrowding and low hygiene condition^(12,19). Two important factors that may have played a contributory role to the near epidemic situation of *Tinea capitis* observed in this study include; (i) the shortness of the hair of the children, which facilitates easy reach of the fungal spores to the scalp⁽⁶⁾, and (ii) most of the infected children were untreated and may probably play a role in the transmission of *Tinea capitis* to their school mates⁽⁵⁾.

The prevalence of *Tinea capitis* in this study was significantly higher in the boys than girls ($P < 0.05$), and this was consistent with findings from previous studies conducted among primary school children in Amsterdam,

Holland⁽²⁰⁾, Tikrit, Iraq⁽¹⁷⁾, and Nablus, Palestine⁽¹⁸⁾.

However in Milwaukee, USA, the sex of children was not associated with *Tinea capitis* in univariate and multivariate analysis⁽²¹⁾. Although it has been reported that the incidence of *Tinea capitis* may vary by sex, depending on the causative fungal organism, boys are generally more infected than the girls⁽⁵⁾. The higher prevalence of *Tinea capitis* among the boys in this study, may be attributed to the very short hair of the boys, their habit of frequent visit to local barbers where the barbing instruments are rarely disinfected, exchange of caps and rubbing of the hair during play and lack of consistent hygienic attention to the scalp⁽²⁷⁾.

A number of previous reports indicated that the prevalence of *Tinea capitis* was higher in children younger than 10 years than older children, with the peak in the age range 3-7 years^(5,18,23). This was confirmed in this study and with a statistical significant difference ($P < 0.05$). The age predilection is believed to result from the presence of *Pityrosporum orbiculare* (*Pityrosporum ovale*), which is part of normal flora, and from the fungistatic properties of fatty acids of short and medium chains in postpubertal sebum⁽⁵⁾. Hence, adults are rarely infected and the tendency of scalp ringworm to clear spontaneously at puberty was believed to be due to the change in sebum composition at this age⁽⁶⁾.

Although it is generally reported that *Pityriasis versicolor* is relatively uncommon in children⁽⁹⁾, the prevalence of the infection observed in this study (4.6%) was comparatively higher than what was recorded among children in Bamako, Mali (1.6%)⁽²⁴⁾, Calabar, Nigeria (3.7%)⁽²⁵⁾, and Taipei, Taiwan (4.4%)⁽²⁶⁾. *Pityriasis versicolor* is known to be predisposed by excessive sweating, increase in humidity, temperature and carbon dioxide tension^(7,9), and there is often a positive family history of the disease⁽²⁷⁾. These factors may have played a role in the infection among the children studied.

When sex was associated with *Pityriasis versicolor* in this study, the girls were significantly more infected than the boys ($P < 0.05$). The reason for this was somewhat obscure. Moreover, on the contrary, the findings in a similar study in Taipei, Taiwan, indicated that boys were more infected than the girls⁽²⁶⁾. Several studies have addressed the frequency of *Tinea versicolor* based on sex, and no dominance of either sex is apparent^(7,9).

No case of *Pityriasis versicolor* was observed among children below 10 years old, while those aged 14-17 years

were significantly more infected ($P < 0.05$). Similarly, the incidence of Pityriasis versicolor was highest in children aged 12-16 years in Cross River, Nigeria (25). This was a confirmation of previous reports that the occurrence of Pityriasis versicolor in young age or before puberty is uncommon and that in tropical countries most infected children fall in the age range 10-19 years (7). Thus the higher prevalence of the infection in older children could be attributed to the active sebaceous glands associated with the post-pubertal age (28).

The prevalence rates of both Tinea capitis and Pityriasis versicolor increased with increase in the number of occupants per bedroom in the children's homes, although differences were not statistically significant ($P < 0.05$). Having up to six or more occupants in a bedroom is associated with a low socioeconomic profile, i.e. low standard of living, poor hygiene, and overcrowded living conditions and these facilitate the transmission of both Tinea capitis and Pityriasis versicolor (17,27).

It is worth stating that a major limitation to this study was our inability to perform the laboratory culture of the specimens, hence we could not determine the different species of the fungi, especially the dermatophytes responsible for the Tinea capitis. Future studies incorporating specimen culture are advocated.

In conclusion, this study makes a strong case for routine surveillance and evaluation of superficial mycoses in schools especially in the warmer and humid countries of the tropics. As a public health measure, asymptomatic carriers of Tinea capitis should be detected and treated, since they are the continuous source of infection. Siblings and playmates of patients should avoid close physical contact and sharing of toys or other personal objects, such as combs and hairbrushes, since organisms can spread from one person to another and infectious agents can be transported to different classrooms within the same or in different schools (2). Tinea versicolor has a high rate of recurrence, and prophylactic treatment with topical or oral therapy on an intermittent basis is necessary to prevent recurrences in most cases (7). These measures could prevent possible epidemics due to superficial mycoses among children of school age in populations of low income status of the tropics.

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CORRESPONDENCE TO

C. J. Uneke Department of Medical Microbiology, Faculty of Clinical Medicine, Ebonyi State University, PMB 053 Abakaliki, Nigeria. Tel: 234-08038928597, Fax: 234-04300222, E-mail: unekecj@ yahoo.com

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Author Information

Chigozie J. Uneke, M.Sc.

Department of Medical Microbiology, Faculty of Clinical Medicine, Ebonyi State University

Bethrand A.F. Ngwu, MBBS

Department of Medical Microbiology, Faculty of Clinical Medicine, Ebonyi State University

Obianuju Egemba

Department of Medical Microbiology, Faculty of Clinical Medicine, Ebonyi State University