Original article

Clinico-epidemiological and Mycological Profile of Tinea Capitis among Primary School Pupils in Zaria, Northwestern Nigeria

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ABSTRACT

Background: Tinea capitis is a common dermatophyte infection affecting the scalp and hair follicles, particularly among children in low- and middle-income countries. It poses a significant public health concern in school-aged populations. This study assessed the clinico-epidemiological features and etiologic agents of tinea capitis among primary school children in Zaria, Nigeria.

Methods: A cross-sectional descriptive study was conducted among 840 pupils aged 5–14 years, consisting of 420 clinically diagnosed cases and 420 age- and sex-matched healthy controls. Tinea capitis was confirmed through fungal culture, and data were analyzed using SPSS version 20.

Results: Among the affected children, 315 (75%) were males, with a mean age of 9.54 years. Significant risk factors included poor personal hygiene (AOR = 2; CI: 1.$^{28–2}$.73), contact with infected peers (AOR = 7; CI: 4.$^{30–11}$.71), and a history of atopy (AOR = 2; CI: 1.$^{24–2}$.91). The most common clinical variant was the grey patch type (45%). Dermatophytes were isolated in 61.2% of samples, predominantly Trichophyton rubrum (42.4%) and T. tonsurans (30.7%).

Conclusion: Non-inflammatory types of tinea capitis were most common. Key risk factors included human contact, poor hygiene, and atopy.

Keywords: *Dermatophytes, clinico-epidemiologic profile, mycological, tinea capitis, school children*

INTRODUCTION

Tinea capitis is a dermatophyte infection of the scalp and hair follicles and is the most common superficial fungal infection among children, particularly in low- and middle-income countries such as Nigeria[1]. Its high prevalence is associated with poor hygiene, overcrowding, and low socioeconomic conditions[1,2]. Nigerian studies report prevalence rates ranging from 9.4% to 51.8%[3,4]. Infection may originate from humans, animals, or soil, corresponding to anthropophilic, zoophilic, and geophilic dermatophytes[5]. Although the disease can occur across all age groups, it predominantly affects children aged 6–12 years and is more common in males[3]. Transmission is facilitated by sharing contaminated items, poor hygiene, overcrowding, and the use of unsterilized barbering equipment[6,7].

Clinical presentation varies depending on geography, host immunity, and the prevailing dermatophyte species[8]. Non-inflammatory forms include grey patch, black dot, and seborrheic dermatitis-like types, while inflammatory variants such as pustules, kerion, and favus may lead to scarring alopecia if untreated[3,8]. Diagnosis is confirmed through direct microscopic examination and fungal culture[9,10].

Previous studies in this setting have largely focused on prevalence and causative agents, with limited attention to clinical patterns and associated risk factors. This study aims to determine the clinico-epidemiologic profile, etiologic agents, and risk factors for tinea capitis among primary school children in Zaria, Nigeria.

MATERIALS AND METHODS

Study Design, Duration and Population

This cross-sectional descriptive study was conducted among 840 primary school pupils aged 5–14 years in Zaria, Northwestern Nigeria, between October 2018 and April 2019. A multistage sampling method was used to select participants from five public primary schools.

The study included 420 pupils with clinical features of tinea capitis and 420 age- and sex-matched healthy controls without symptoms.

Sampling Frame and Technique

A minimum sample size of 420 was calculated using the WHO Health Survey Statistics formula,11 based on a 45% prevalence of tinea capitis in a previous local study.[12]

A multistage sampling technique was applied:

Stage 1: Five wards were randomly selected out of the thirteen geopolitical wards in Zaria LGA using simple balloting.

Stage 2: From each selected ward, one primary school was randomly chosen, giving five schools in total. School enrolment registers were used to determine pupil populations, and proportionate allocation was applied to assign the required number of study participants per school.

Stage 3: Each selected school was stratified into six class arms (P1–P6). One class per arm was chosen by balloting. All pupils in selected classes were examined for scalp lesions consistent with tinea capitis. Where cases exceeded the allocated number for a school, balloting was used to randomly select the required number of cases whose parents had completed the informed consent.

Stage 4: Within each class, a proportionate sample of tinea capitis cases was selected using simple random sampling, ensuring each school contributed according to its predetermined allocation.

Screening and Recruitment of Patients

Children in selected classes underwent assessment using questionnaires and physical examinations focusing on scalp evaluation. Information on socio-demographics, risk factors, hygiene practices, and clinical history was collected. Socioeconomic status was classified using Oyedeji's method,13 while personal hygiene was graded based on cleanliness and grooming.

Scalp examinations were conducted in classrooms with teachers serving as chaperones, and samples were collected for fungal analysis. Controls were healthy classmates matched by age and sex, with no clinical signs of tinea capitis.

Data Entry and Analysis

Data were analyzed using SPSS version 20. Descriptive statistics were used to summarized socio- demographic characteristics. Comparisons between cases and controls

was done using

Student's t-test for numerical variables and Chi-square or Fisher's exact test for categorical variables. Variables with p < 0.2 in bivariate analysis were entered into a multivariate logistic regression model, using forward selection to identify independent risk factors. Statistical significance was set at p < 0.05.

Ethical Considerations

Ethical approval was obtained from the ABUTH Health Research Ethics Committee (Ref: ABUTHZ/HREC/M05/2017). Permission was granted by the local education authority, and parental consent plus child assent (≥8 years) were obtained. All identified cases of tinea capitis were treated with oral Griseofulvin. Participation was fully voluntary, with no inducement or coercion.

RESULTS

Sociodemographic characteristics of the study participants

The mean age was 9.54 + 2.38 years for the children with tinea capitis and 9.50 + 2.61 years for the controls, and majority were males (75%). There was no statistically significant difference between the mean age distribution of the two populations (p = 1.000) Table 1.

Possible risk factors for acquiring tinea capitis

Children with poor personal hygiene were twice as likely to develop tinea capitis (AOR=2, CI (1.$^{28-2}$.73), p value= 0.001). A history of contact with infected children increases the risk sevenfold (AOR= 7, CI= 4.$^{30-11}$.71, p value <0.001), while having an affected family member (AOR= 2, CI= 1.$^{68-3}$.56, p value <0.001) or atopic symptoms (AOR= 2, CI= 1.$^{28-2}$.73, p value= 0.001) doubles the risk for acquiring tinea capitis. Contact with domestic animals showed no significant association. Although self-barbing with razor blades was more common among cases and showed a significant difference (X2=13.336, df=3, p value=0.004), grooming practices did not remain a predictor after multivariate analysis. Table 2

Clinical characteristics of tinea capitis among the study population

The symptoms of tinea capitis lasted 1–113 weeks, with 66% of cases lasting 5–12 weeks. Scalp scaling was the most common symptom (80%), and lymph node enlargement was significantly more frequent in cases (60.2%) than controls (2.9%). Hair loss (58.6%) was also significantly more common in affected children, mostly presenting as patchy, non-scarring alopecia (97.1%). The most common clinical type was Grey Patch tinea capitis (45%) Fig. 1a, followed by Seborrheic dermatitis-like (35.5%) Fig 1b and Black Dot (13.3%) Fig.1c. Inflammatory forms included pustular (5.2%) Fig. 1a, Favus (0.7%) Fig. 2b, and Kerion (0.2%) Fig.2c.

Mycology results

KOH examination was positive in 347 (82.6%) of the specimens. A positive culture yield for dermatophytes was observed in 257 (61.2%) samples. Table 3. Both microscopy and culture were positive in scalp scrapings of 227 (54.05%) participants. Of the positive cultures, 30 (7.14%), had negative findings on microscopy. The culture and microscopy were both negative in 43 (10.24%) samples. The sensitivity and specificity of KOH examination in relation to a positive fungal culture were 0.88 and 0.26 respectively. There were no cases of mixed dermatophyte species isolates.

Characteristics	Tinea capitis n=420	Control n=420	p value
Age 5–8 years	135 (32.1%)	143 (34%)	0.476
Age 9–12 years	244 (58.1%)	228 (54.3%)	
Age 13–16 years	41 (9.8%)	49 (11.7%)	
Mean age (±SD)	9.54±2.38	9.50±2.61	1.000
Males	315 (75%)	315 (75%)	1.000
Females	105 (25%)	105 (25%)	
Hausa ethnicity	391 (93.1%)	417 (99.3%)	<0.001
Other ethnicity	29 (6.9%)	3 (0.7%)	
Islam	411 (97.9%)	417 (99.3%)	0.081
Christianity	9 (2.1%)	3 (0.7%)	
Lower class (P1–3)	217 (51.7%)	217 (51.7%)	0.679
Higher class (P4–6)	203 (48.8%)	203 (48.3%)	

Table 1: Sociodemographic characteristics of the study participants

Risk factor	Tinea capitis n=420	Control n=420	AOR (CI)	p value
Poor hygiene	193 (46.0%)	101 (24.0%)	2 (1.28–2.73)	0.001
Good hygiene	227 (54.0%)	319 (76%)		
Animal contact	266 (63.3%)	238 (56.7%)	0.93 (0.66–1.32)	0.688
Human contact	337 (65.2%)	180 (42.9%)	7 (4.30–11.71)	<0.001
Family history	268 (63.8%)	111 (26.4%)	2 (1.68–3.56)	<0.001
Soil contact	268 (63.8%)	190 (45.5%)	1 (0.80–2.04)	0.305
Sharing beds	405 (96.4%)	398 (94.8%)		0.239
Sharing combs	178 (42.4%)	164 (39.0%)		0.326
Positive atopy history	108 (25.8%)	61 (14.5%)	2 (1.24–2.91)	0.003
Self-barbing at home	204 (48.6%)	160 (38.1%)	2 (0.57–4.67)	0.352

Table 2: Comparison of some possible risk factors for acquiring tinea capitis infection among the cases and controls

KOH / culture finding	Frequency n=420 (%)
KOH positive for dermatophytes	347 (82.6%)
KOH negative for dermatophytes	73 (17.4%)
Positive fungal cultures	257 (61.2%)
T. rubrum	109 (42.4%)
T. tonsurans	79 (30.7%)
M. canis	25 (9.7%)
M. audouinii	18 (7.0%)
M. gypseum	18 (7.0%)
T. mentagrophytes	6 (2.3%)
T. schoenleinii	2 (0.8%)
Negative fungal cultures	163 (38.8%)

Table 3: Showing results of KOH examination and culture of the skin scrapings of children with tinea capitis

Fig. 1a: Grey patch tinea capitis with patchy areas of hair loss

Fig. 1b: Seborrheic dermatitis-like tinea capitis with diffuse scaling

Fig. 1c: Black dot tinea capitis showing a patch of alopecia with broken-off hair stubs

Fig. 2a: Pustular variant of tinea capitis showing scattered pustules

Fig. 2b: Favus tinea capitis with yellow crusted cup-shaped lesions around follicular openings

Fig. 2c: Kerion tinea capitis showing boggy tumours studded with pustules and associated hair loss

DISCUSSION

Tinea capitis remains the most common superficial fungal infection among school-aged children in low- and middle-income countries like Nigeria.[1] The study found the highest prevalence in children aged 9–12 years, consistent with similar research.[15,16] This age group is more active, often engaged in contact sports, sharing personal items, and transitioning to self-care, which may contribute to higher infection risk. However, some studies have also reported higher infection rates in younger children still reliant on caregivers for hygiene.[3,9,14]

The findings from this study shows that males were three times more likely to develop tinea capitis than females, a trend supported by several previous studies.[3,7,9] Contributing factors may include greater exposure to infection through physical play, hormonal differences, and delayed puberty in males.[17] Females may have lower infection rates due to earlier puberty, better hygiene, and grooming habits like using personal combs and oils. Additionally, low female school enrollment in the study area may have influenced findings. However, other studies have reported higher or equal infection rates in females, highlighting regional and cultural variations.[4,16].18

The predominant tribe and religion of the studied population was Hausa and Islam respectively. This reflects the nature of the geographic location where the study was carried out. Zaria is predominantly occupied by the Hausa- Muslims.

Subjects in this study were mostly from low socioeconomic families, where parents engaged mainly in low-skilled low-income jobs such as craftwork and subsistence farming, with most of them having secondary education and below. Since this study looked at children in the public schools, which are free of charge, children from the low socioeconomic class were more likely to cluster in those public schools.

This study identified key risk factors for tinea capitis in children, including poor hygiene, close human contact, history of tinea capitis in a family member and atopy. These findings align with previous research within and outside Nigeria.[1-8] Poor hygiene, especially infrequent bathing and inadequate hair grooming, may aid transmission and persistence of fungal pathogens.[1,3] However, a similar study done in India did not observed any significant association between poor hygiene and acquisition of tinea capitis.[19,20]Animal contact, common in Zaria due to domestic rearing of goats, dogs, and other animals, was also

linked to infection, as animals can act as zoonotic reservoirs, as documented by Abdulqadir et al.[22] Other sources of infection can be from contact with fungus contaminated objects of livestock rearing such as their dung, halters, rope, harness and grooming brushes, that were found to be important sources in the natural dissemination of the disease.[23]. Human contact—particularly within families and neighborhoods rather than schools—was another significant factor, as children spend more time at home and play in close contact. Although living in large families was observed, it was not statistically significant as a risk factor. A positive history of atopy (e.g., asthma or hay fever) was significantly associated with tinea capitis, consistent with earlier studies.[24,25] Regarding grooming practices, many children with the infection reported self- barbing at home with razor blades, likely due to financial constraints. This is contrary to study by Akinboro et al.[3] and Ayanlowo et al.[4] which showed that most of the children with tinea capitis patronized local barbers' shop without personal clippers. However, unlike other studies,[1,4] this research did not find comb sharing, contact with soil, or carrying objects on the head to be significant risk factors—possibly because both cases and controls shared similar low socioeconomic backgrounds and practices.

This study found the non-inflammatory grey patch type to be the most common variant of tinea capitis, consistent with many epidemiological studies. 1,3,8,14,26,27 The seborrheic dermatitis-like (diffuse scaling) type was the second most common, followed by the black dot type—contrary to findings in some regions where the black dot or seborrheic types were more prevalent. 1,3,8,14 These differences may reflect the broad clinical spectrum of tinea capitis, which can range from asymptomatic carriers to severe inflammatory forms like kerion or favus, influenced by host immune response[34]. Furthermore, the black dot may persist beyond the anagen phase into the telogen phase and sometimes presents as seborrheic dermatitis-like diffuse scaling.[27]While this study aligns with findings in Kolkata,19 where grey patch and seborrheic types were most common, it contrasts with North Indian studies reporting seborrheic dermatitis-like as the dominant form and others from Pakistan and Taiwan where black dot was more prevalent.[26,28,29] Inflammatory variants were less frequently observed in this study, similar to some past reports but contrary to others showing higher incidence.[1,3,8,27] Scalp scaling was the most common symptom (88.8%), consistent with earlier studies reporting 80–100%.[30,31] Adenopathy was observed in 60.2% of cases, within the 42–72% range found in other studies, and noted in both inflammatory and non-inflammatory types.[31-33] Hubbard et al.[31] detected posterior auricular or occipital adenopathy present in 65% of children with tinea capitis, and suggested that the presence of adenopathy increased the likelihood of a culture positive for fungi in the noninflammatory form of tinea capitis, while its absence suggested an origin other than fungal.

In this study, KOH examination detected fungal elements in 82.6% of samples, aligning with previous findings by Soyinka et al[7]. The culture yield for dermatophytes was 61.2%, consistent with similar studies,[3,14] but higher than the 39.5% reported by Isa et al.,34 and lower than the 73–100% reported by others.[35,36] Variability in culture yield may result from poor sample collection, inadequate samples, or prior antifungal treatment.[37] The most common dermatophyte isolated was Trichophyton rubrum, an anthropophilic species, accounting for over 80% of isolates. This finding is supported by the high number of children with a history of contact with other infected individuals, mainly family members. Trichophyton rubrum has also been reported as the dominant species in similar studies from northern Nigeria, such as those by Dogo et al.[12] and Adeleke et al.[37] However, this contrasts with studies from southern Nigeria, where Trichophyton mentagrophytes is the most prevalent isolate. 3,4,38,39 This regional variation suggests an ongoing aetiological shift in dermatophyte species, influenced by factors like human migration, climate change, animal husbandry practices, and the emergence of new fungal genotypes.[38] Such shifts have also been observed internationally in countries like the U.S. and Germany.

Tinea capitis remains a disease of public health importance especially in children, thus the need for early identification and institution of appropriate treatment to prevent spread of infection to other children. The non–inflammatory (GPTC, SDTC and BDTC) were the most common clinical types of tinea capitis among primary school children in Zaria. Human contact, poor personal hygiene, history of tinea capitis in a family member, and a positive history of atopy were the possible risk for contracting the disease observed from this study.

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