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SYSTEMATIC REVIEW



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A Systematic Review of Superficial Fungal Infections in Nigerian Children and a Case for Recognition as Neglected Tropical Diseases

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Abstract

Background: Superficial fungal infections (SFIs) are among the most common infectious dermatoses in children worldwide. In low- and middle-income countries such as Nigeria, they remain highly prevalent, yet under-prioritised in public health policy.

Objective: To systematically review the epidemiology, clinical spectrum, risk factors, and public health implications of superficial fungal infections among Nigerian children and assess whether they meet criteria consistent with neglected tropical diseases (NTDs).

Methods: We conducted a systematic search of PubMed, African Journals Online, Google Scholar, and institutional repositories for studies published from 2005 to 2025 that reported primary epidemiological data on SFIs in Nigerian children. Inclusion criteria comprised studies reporting prevalence and clinical patterns in individuals ≤18 years, and available in English. Data were extracted on study location, population studied, sample size, prevalence rates and clinical types of SFI, common organisms and risk factors.

Results: Thirty-three studies met the inclusion criteria. Reported prevalence ranged from 4.7% to 75.7%, with most studies documenting rates of 20–60%. Tinea capitis was consistently the predominant infection, particularly among children aged 6–12 years, with male predominance. Risk factors included overcrowding, poor hygiene, low socioeconomic status, and sharing of personal grooming tools. Diagnostic heterogeneity and limited mycological confirmation were common limitations. The review showed some similarities between SFIs and the officially recognised neglected tropical diseases.

Conclusion: Superficial fungal infections are highly prevalent among Nigerian children but remain under-recognised in national disease prioritisation frameworks. There's a need to designate these infections as neglected tropical diseases in order to improve their control and prevention.

Keywords: Candida, Dermatophytosis, Low socioeconomic status, Malassezia, Superficial mycosis, Tinea capitis.

Introduction

Superficial fungal infections (SFIs) are caused by dermatophytes — fungi that invade keratinised tissues (skin, hair, nails) — and non-dermatophyte organisms such as *Candida* and *Malassezia*.[1] Despite being a recognised global public health problem, most symptomatic patients never seek care.[2,3] SFIs can be disfiguring and cause intractable itch, significantly reducing quality of life.[2] SFIs occur across all demographics but disproportionately affect children. A systematic review across Africa recorded an overall SFI prevalence of 17%, with Nigerian children

averaging over 23%.[4] The contributing factors include low socioeconomic status, overcrowding, and animal contact, compounded by psychosocial stigma. Yet childhood dermatophytosis has attracted little targeted public health intervention compared to conditions like scabies and leprosy — despite sharing key features with neglected tropical diseases (NTDs).

The World Health Organisation (WHO) defines NTDs as a diverse group of transmissible infections affecting over 1.5 billion impoverished people lacking access to clean water, sanitation, and quality healthcare.[5] Currently, only certain deep mycoses are classified as NTDs; no dermatophytoses are yet included.[6] NTD-defining characteristics include causation of more disability than mortality, chronic clinical course, longstanding existence with minimal research, tropical/subtropical distribution, and strong association with poverty[6] - all of these apply equally to SFIs. This review therefore argues that the same intervention strategies used for NTDs should be applied to childhood SFIs to improve quality of life for affected children and communities.

This systematic review aims to examine the available literature from Nigeria on childhood SFIs and describe the burden and determinants to make a case for consideration of childhood dermatophytosis as a possible NTD.

Review Methods

This systematic review examined published literature on SFIs in Nigerian children retrieved from PubMed, African Journals Online (AJOL), Google Scholar, and institutional repositories. Search terms included combinations of "superficial fungal infections", "tinea capitis", "dermatophytosis", "pityriasis versicolor", "Nigeria", "children", and "school", restricted to studies published between 2005 and December 2025.

Inclusion criteria: Nigerian studies with participants under 18 years, reporting primary prevalence or clinical pattern data, and available in English.

Exclusion criteria: Adult-only or mixed adult-child populations, non-primary data sources (reviews, case reports, conference abstracts), invasive/systemic mycoses only, or laboratory data without clinical correlation.

The extracted variables included the author, year, location, population, sample size, participant age, prevalence rate, most common infection, predominant organism, and reported risk factors. A representation of the search schema is shown in Figure 1.

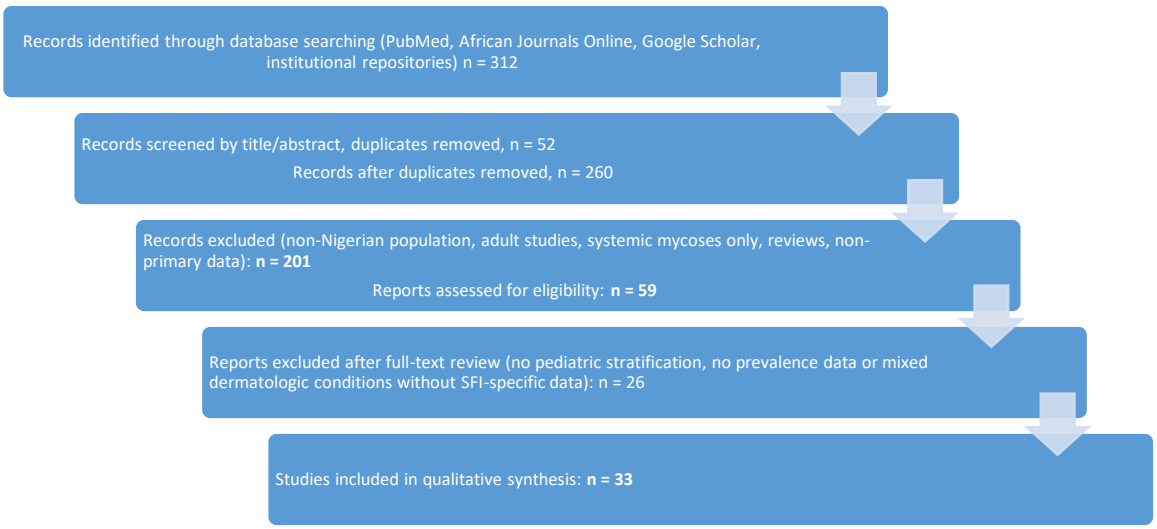


Figure 1: PRISMA flow diagram for the search criteria.

Results

A total of 33 full-text articles were included in the qualitative analysis; the majority of these studied primary school children. The combined sample includes >100,000 children from urban, rural, agrarian, nomadic, and commercial communities. Meta-analysis (quantitative analysis) was not performed due to the high heterogeneity in the study methods and reporting of clinical patterns and risk factors. Table I summarises the characteristics of the included studies.

Epidemiology and prevalence of childhood SFIs

Across the 33 studies from several regions of Nigeria, the prevalence of SFIs among children was high and variable, ranging from 4.7% to 75.7%, depending on diagnostic methods (clinical versus culture), region, and socio-economic context. Most studies reported prevalence rates from 20% to 60%, with nine studies below 20% and six above 60%. Studies were more concentrated in the south-east and south-west regions, with no studies from the north-east; however, one or more studies from every other region reported prevalence within the 20–60% range.[7,13,15,25,38] All the reviewed studies employed a cross-sectional design, predominantly recruiting primary school children. Notable exceptions include Nweze *et al.*,[17] who studied children in nomadic herdsmen camps in south-east Nigeria (prevalence 41%), and hospital-based studies by Okafor *et al.* and Altraide and Alex-Hart, which reported lower prevalences of 6.7% and 8.1%, respectively.[20,31] One case-control study for dermatophytosis originally reported 91.35%, which was recalculated as 45.1% to account for the study design and is the value used in this review.[29]

Despite methodological heterogeneity, the available data consistently indicate that SFIs are highly prevalent among Nigerian children, with most prevalence exceeding 20% across all sub-regions. Regarding age distribution, most studies reported the highest burden among primary school-aged children (6 to 12 years), with fewer infections recorded above 12 years of age.[14,36] A minority of studies found no significant age-related differences,[19,21,25,31] while others identified peak infection in older (10 to 14 years) or pre-school (below 6 years) age groups.[7,15,38] Male sex was the predominant risk demographic in most studies, with only a few reporting no significant gender difference.[7,17,25,31] Collectively, the evidence supports a predilection of SFIs for male children aged 6 to 12 years.

Clinical spectrum of SFIs in Nigerian children

Tinea capitis emerged consistently as the predominant SFI across reviewed studies, with a wide prevalence range of 3.9% to 85.4%. Only one study identified tinea corporis as the leading type (50%), with tinea capitis next at 23.3%.[31] Non-inflammatory forms of dermatophytosis accounted for more than 95% of documented cases of tinea capitis, though the relative proportion of grey patch versus black dot types varied across studies. Inflammatory presentations, such as kerion, were uncommon (1% to 2%).[23,36] Other SFIs occurred at considerably lower frequencies: tinea corporis (0.6% to 8.5%), tinea faciei (0.5% to 1.1%), tinea pedis and unguium (0.1% to 0.9%), and pityriasis versicolor (2.4% to 6.1%).[10,13,14,23,31,36]

Aetiologic agents (Dermatophytes) of SFIs

More than three-quarters of the reviewed studies successfully isolated causative fungal organisms. Three dermatophyte genera predominated: *Trichophyton spp.*, *Microsporum spp.*, and *Epidermophyton spp.* The most commonly reported leading isolates were *T. mentagrophytes* (five studies),[7,17,22,30,39] *T. rubrum* (five studies),[21,25,26,29,33] *M. audouinii* (three studies),[16,18,23] *T. tonsurans* and *T. soudanense* (two studies each),[14,15,35,36] and *M. canis*, *M. gypseum*, and *E. floccosum* (one study each).[12,27,37]

Table 1a: Characteristics of reviewed studies

Authors / Year	Location	Population	Sample size	Age Range	Prevalence	Most Common Infection	Most Common Dermatophytes	Major Risk Factors
Anosike *et al.*, 2005, [7]	Ebonyi	Primary pupils	279	5-13yrs	21.1%	Not documented	*T. mentagrophytes* 22%	Age group
Enendu & Ibe, 2005 [8]	Uli, Anambra	Primary school	1,020	4-15yr	13.9%	Tinea capitis 15.5%	*T. tonsurans* 27.3%	Not documented
Nweze & Okafor, 2005 [9]	Anambra	Primary schools	1,624	4–16 yrs	5.9%	Tinea capitis 45%	*T. tonsurans* 37.5%	Age group, rural areas
Ogunbiyi *et al.*, 2005, [10]	Ibadan	Primary schools	1,066	4–15 yrs	15.2%	Tinea capitis 14.5%	ND	Large family; pets; shared clothing
Uneke *et al.*, 2005 [11]	Ebonyi	Primary and Secondary schools	500	7–17	62.4%	Tinea capitis 51.8%	ND	No statistically significant risk factors
Mbata & Nwajagu, 2006[12]	Awka	Nursery and Primary school	2,117	1–13	4.7%	Tinea capitis 3.9%	*M. gypseum* 33.3%	Not documented
Oyedeji *et al.*, 2006 [13]	Ijesha land	Primary school	1,120	6–12	21.1%	Tinea capitis 43.3%	ND	Age group, Male sex
Ngwogu & Otokunefor, 2007 [14]	Abia (rural)	Primary schools	4,287	4–18 yrs	20.4%	Tinea capitis 13.7%	*T. soudanense*, 26.2%	Not documented
Ayanbimpe *et al.*, 2008 [15]	Benue & Plateau)	Primary pupils	28,505	3–16 yrs	31.2%	Tinea capitis 31.2%	*T. soudanense* 30.6%.	Age group, Male sex
Emele & Oyeka, 2008 [16]	Anambra	Primary schools	47,723	2.5–15	9.4%	Tinea capitis 9.4%	*M. audouinii* 42%	No statistically significant risk factors
Nweze, 2010 [17]	Fulani/Hausa camps Enugu	Nomadic camps	390	4–17	41.5%	Tinea capitis 69.1%	*T. mentagrophytes,* 29.1%	Age group
Sanuth & Efuntoye, 2010[18]	Ago-Iwoye, Ogun	Primary school	1,404	7-12	19.5%	Tinea capitis 82.4%	*M. audouinii* 14%	Soil/animals, poverty
Amoran *et al.*, 2011, [19]	Sagamu	Primary school	480	5-16	74.1%	Tinea capitis 41.8%	ND	Male sex, previous infection, sharing towels
Okafor *et al.*., 2011 [20]	Ibadan	Hospital based	402	3mo – 12 yrs	6.7%	Tinea capitis 6.7%	ND	Low SES, male sex
Enemuor *et al.*, 2013 [21]	Anyigba, Kogi	Primary pupils	2,184	4-15	6.6%	Tinea capitis 85.4%	*T. rubrum* 30.3%	Male sex, low parental education
Ayanlowo *et al.*, 2014, [22]	Sagamu, Ogun State	Primary schools	604	2–17	53%	Tinea capitis 15.4%	*T. mentagroph-ytes* 51.7%	Low SES
Oke *et al.*, 2014[23]	Ile-Ife, Osun	Primary pupils	800	5–16	35%	Tinea capitis 26.9%	*M. audouinii* 28%	Male sex, tribe
Ogbu *et al.*, 2015 [24]	Awka South	Primary school	870	5–14	40.6%	Tinea capitis 64.9%	ND	No statistically significant risk factors
Dogo *et al.*, 2016[25]	Kaduna	Primary schools	100	5–15	45%	Tinea capitis 45%	*T. rubrum* 28.8%	Family size, bed sharing

ND – Not Documented

Table 1b: Characteristics of reviewed studies

Authors / Year	Location	Population	Sample size	Age Range	Prevalence	Most Common Infection	Most Common Dermatophytes	Major Risk Factors
Ahmed, 2017[26]	Kaduna	Primary school	100	5–15	45%	Tinea capitis 45%	*T. rubrum* 27.2%	Age group, number of persons living in the house, barbers
Afolabi *et al.*, 2018[27]	Osun	Primary schools (public vs private)	420	4–16	21.7%	Tinea capitis 21.7%	*E. floccosum* 12% Non-dermatophytes 33%	Poor hygiene, low SES, public schools, sharing combs, sand play
Damen *et al.*, 2018[28]	Plateau	Primary school	185	5–12	65.4%	Tinea capitis 65.4%	*Trichophyton spp.* 49.7%	No statistically significant risk factors
Adesiji *et al.*, 2019[29]	Osogbo (case-control)	Primary schools	230	4–15	45.6%	Tinea capitis (45.6%)	*T. rubrum* 34%	Poor hygiene, age group
Anya & Sunday, 2019[30]	Aba	Primary school	100	5-13	53%	Not Documented	*T. mentagrophytes* 43.4%	Not documented
Altraide & Alex-Hart, 2020[31]	Port Harcourt	Hospital-based study	347	6–18	8.17%	Tinea capitis 23.3% Tinea corporis 50%	ND	No statistically significant risk factors
Odeigah *et al*., 2020[32]	Ilorin	Primary pupils	602	5–16	29.9%	Not documented	Dermatophytes 16.7% Non-Dermatophytes 51.7%	Age 9–12, overcrowding, poor hygiene
Ayodele *et al.*, 2021[33]	N. Central Nigeria	Primary pupils	301	5–14	75.7%	Tinea capitis 75.7%	*T. rubrum* 68.9%	Large family size
Ezomike *et al*., 2021[34]	Enugu	Primary pupils (urban vs rural)	1,662	5–15	45%	Tinea capitis 73.7%	ND	Urban residence, poor hygiene, Male sex
Olarinoye *et al.*, 2021[35]	Ilorin	Primary schools	204	4-16	73.5%	Tinea capitis 66.1%	*T. tonsurans* 41.2%	No statistically significant risk factors
Onubogu *et al.*, 2022[36]	Ukpor & Nnewi (agrarian vs commercial)	Primary pupils	1,562	5–15	28.9%	Tinea capitis 23.5%	*T. tonsurans* 37.7%	Male sex, public schools, low socio-economic class
Ukhureigbe *et al.*, 2022[37]	SW Nigeria	Primary schools	102	1–14	73.5%	Tinea capitis 73.5%	*M. canis,* 28%	No statistically significant risk factors
Okpo *et al.*, 2024[38]	Calabar	Primary school	779	4–17	25.9%	Tinea capitis 63.9%	*Trichophyton spp.* 35.6%	No statistically significant risk factors
Abdu *et al.*, 2025[39]	Kaduna metropolis	Primary school	400	3–14	29.3%	Tinea capitis 29.3%	*T. mentagrophytes* 10.8%	No statistically significant risk factors

ND – Not Documented

Non-dermatophyte fungi were the predominant isolates in two studies.[27,32] No consistent regional distribution pattern was identified, though *Trichophyton spp.* dominated across most regions, with the exception of the south-west, where *Microsporum spp.* predominated in half of the studies.

Associated risk factors of reported SFIs

Multiple risk factors were identified across studies, though fewer underwent formal

statistical testing. Age 6 to 12 years was the most frequently implicated age group,[7,9,13,15,17,26,29,32] and male sex was consistently associated with higher infection rates.[13,15,19–21,23,34,36] Low socioeconomic status was significantly associated with SFIs in several studies.[18,20–22,27,36] Additional factors included large household size, bed-sharing, overcrowding,[10,25,26,32,33] poor personal hygiene (infrequent bathing, not using soap, poor hair care),[27,29,32,34] sharing of personal items such as combs and towels, attendance at community barbers, and close-contact play.[10,19,25–27] Contact with soil or animals was documented in a subset of studies,[10,18,27] as was attendance at public schools.[27,36] A prior episode of SFI was identified as a risk factor for recurrence in one study.[19]

Antifungal susceptibility studies for SFIs

Only two studies examined antifungal susceptibility patterns, with limited overlap in isolates and agents tested, precluding meaningful comparison. Notably, shared isolates (*T. rubrum*, *T. mentagrophytes*, *M. ferrugineum*) yielded contradictory susceptibility results between the two studies for itraconazole, terbinafine, and griseofulvin.[33,39] The data are therefore insufficient to support generalisable conclusions regarding antifungal susceptibility for SFIs in Nigeria.

Co-morbidities of SFIs in Nigerian children

Several studies documented concurrent skin conditions, with scabies reported at a prevalence of 1.1% to 10.8%,[10,13,19,31] a finding of public health relevance given scabies' designation as a Neglected Tropical Disease (NTD) in 2017.[5] Scarring or patchy alopecia was documented in 15.7% to 38.8% of affected children in two studies,[22,35] and psychosocial distress was reported in 50% of affected children by Olarinoye *et al.*[35] Two studies examining health-seeking behaviour found that more than 90% of affected children did not access appropriate medical care, and up to 70% were self-medicating or using unorthodox treatments.[19,35]

Discussion

This review demonstrates that SFIs are highly prevalent among Nigerian school children, with tinea capitis dominating the clinical spectrum. Rates vary across regions and methodologies, yet many studies report prevalence approaching or exceeding that of other endemic dermatoses such as scabies. The burden is compounded by significant treatment gaps, with most affected children receiving no care or inappropriate remedies. The absence of nationwide prevalence studies, standardised diagnostic criteria, and longitudinal data limits accurate national burden estimation.

The key drivers of this high endemicity include low socio-economic status or poverty, overcrowding and poor personal hygiene. These social determinants highlight the need for improved health advocacy with particular emphasis on strengthening the school-based health screening programme, as emphasised by many of the studies. Unfortunately, there was limited local antifungal susceptibility data to inform evidence-based empirical treatment guidelines for SFIs in Nigeria. Although no mortality was attributed to SFIs, they represent a persistent community health concern owing to significant psychosocial sequelae, cosmetic consequences (e.g., alopecia), household transmission risk and potential for educational disruption from constant itching/irritation.

Should SFIs be considered Neglected Tropical Diseases?

SFIs in Nigerian children align with several WHO criteria for NTDs: they are prevalent in tropical regions, disproportionately affect populations living in poverty, carry significant health and social consequences, and receive limited research funding and policy attention.[5] Low socio-economic status was the single risk factor most consistently associated with SFIs in this review, supporting a parallel with the poverty-driven nature of NTDs. The geographic distribution is consistent with tropical endemicity, and the associated morbidity (psychological distress, alopecia) without

reported mortality mirrors the predominantly morbidity-driven profile of NTDs. The paucity of antifungal susceptibility data and the apparent absence of national treatment guidelines further reflect the neglect characteristic of NTDs.

Importantly, the prevalence of SFIs far exceeds the prevalence of scabies (designated an NTD in 2017) by 20-fold or more in the reviewed studies, suggesting SFIs may warrant comparable recognition. However, the case for NTD designation is weakened by the absence of school absenteeism data, disability-adjusted life year (DALY) estimates, and cost-burden analyses, which are essential for objective comparison with already-designated NTDs. [6] Accordingly, while formal WHO NTD classification is not currently supported by the available evidence, SFIs in Nigerian children may reasonably be described as neglected dermatologic infections of poverty.

Methodological limitations and research gaps

All reviewed studies were cross-sectional studies, and no longitudinal data were presented. So, recurrence rates, chronicity, and long-term outcomes like psychosocial impact could not be studied. The predominance of school-based sampling limited random sampling methods, and the absence of a standardised diagnostic framework introduced risks of selection bias and comparability. Heavy reliance on clinical diagnosis, with only limited laboratory confirmation, further undermines data quality.

There was also an absence of nationally pooled estimates from a nationwide prevalence study across the six geopolitical zones, no cost-of-illness or DALYs studies, and no antifungal resistance surveillance. These gaps limit precise burden estimation. The overall quality of the studies was moderate to low due to poor randomisation, inconsistencies in the results with wide variations among the studies, and indirectness in assessing risk factors.

Future research recommendations

To remedy some of the research gaps highlighted, it will be prudent to conduct multi-centre nationwide prevalence surveys to establish national representative data on SFIs in Nigerian children. There should be standardised diagnostic criteria (clinical + microscopy + culture) to have uniform criteria for recruitment of study subjects. Establishing a fungal pathogen surveillance registry will improve the understanding of SFIs' epidemiology in Nigeria, as well as facilitate the investigation of antifungal resistance trends. Longitudinal cohort studies should be performed to enable studying the determinants and outcomes of SFIs in Nigerian children. Studies should be conducted to evaluate school-based screening programs targeting SFIs, given the preponderance of these infections in the school-aged group. Cost-benefit and cost-effectiveness analyses of mass treatment or screening can be conducted to underscore the economic importance of SFIs as potential NTDs.

Policy recommendations

Nigerian educational and health policies should integrate SFIs into the school health programs to improve the control of these conditions. There should be health policies to include SFI surveillance within Nigeria's NTD strategic framework. This will help to leverage existing systems to provide a holistic approach to the treatment and control of childhood SFIs. In addition, policies should be developed on national treatment guidelines specific to paediatric populations, for more effective therapies. General health promotion policies should include hygiene education campaigns targeting primary schools. This will significantly impact the reduction of the prevalence of SFIs, which have been associated with poor hygiene practices. Lastly, national drug procurement policies should be directed at providing essential antifungal medications for treating SFIs in order to improve treatment access and reduce the number of children with untreated infections.

Conclusion

Superficial fungal infections, as typified by *tinea capitis,* are quite common among Nigerian children. Although they are not classically listed under WHO's list of NTDs, these SFIs share several features with known neglected diseases due to the high disease burden in low socio-economic classes, association with poor sanitation and overcrowding and limited surveillance and health policy attention. Despite this wide prevalence, SFIs among Nigerian children receive limited national public health prioritisation, and there is inadequate aggregated data at the national level. Therefore, a call to designate SFIs in children as neglected dermatologic tropical diseases may draw attention and increase awareness of this underserved population.

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