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## Prevalence and Risk Factors of Tinea Capitis Among School-Aged Children in Bauchi North, Bauchi State, Nigeria

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### Abstract

*Tinea capitis*, a highly contagious fungal infection affecting the scalp and hair shafts, represents a significant public health concern among children, particularly in low- and middle-income countries. Despite its recognized burden, there is limited epidemiological data on its prevalence and determinants in Bauchi North Senatorial District. This study aimed to determine the prevalence of *tinea capitis* and identify associated risk factors among school-aged children in Bauchi North, Bauchi State Nigeria. A cross-sectional study was conducted involving 385 children aged 3 to 14 years, selected from primary schools across the region. Scalp and hair samples were collected and analyzed microscopically using potassium hydroxide (KOH) preparations to detect fungal elements. Structured questionnaires were used to obtain sociodemographic and environmental information. Data analysis was performed using SPSS version 23, with Chi-square tests and binary logistic regression employed to assess associations between potential risk factors and *tinea capitis* infection. The overall prevalence was 31.58%, with males (26.32%) more affected than females (5.26%). The highest infection rate occurred in the 3-5-year age group (14.03%). Statistically significant risk factors included rural residence (OR = 7.600; 95% CI: 3.137-18.410;  $p < 0.001$ ), low socioeconomic status, poor hygiene practices, overcrowding, and ownership of domestic animals. Protective factors were identified as regular hair washing (OR = 0.307;  $p < 0.001$ ), frequent visits to barbers or salons (OR = 0.288;  $p < 0.001$ ), disinfection of grooming tools, and consistent use of soap or shampoo. Clinical symptoms strongly associated with infection included scalp itching, scaling, and patchy hair loss. The findings underscore that *tinea capitis* remains a prevalent and neglected health issue among children in Bauchi North, fueled by poverty, inadequate hygiene, and environmental exposures. Targeted public health interventions focusing on hygiene promotion, community education, and early treatment are essential to reduce the burden of the disease.

### Keywords

*Tinea capitis*,  
School-aged,  
Dermatophytosis,  
Fungal infections.

## INTRODUCTION

Fungal infections are among the most prevalent infectious diseases globally, with superficial mycoses affecting nearly 20–25% of the world's population, making them a significant public health concern (Leung et al., 2020). These infections primarily involve keratinized tissues such as skin, hair, and nails, and are commonly caused by dermatophytes, particularly *Trichophyton* and *Microsporum* species (Gupta et al., 2018; Li et al., 2025). In Africa, especially Nigeria, the prevalence of superficial fungal infections is notably high, influenced by climatic, socioeconomic, and hygienic factors (Idris et al., 2023; Magaji et al., 2025). Among the various forms of superficial mycoses, tinea capitis stands out as a particularly common and burdensome scalp infection in children, especially in tropical and subtropical regions like Nigeria (Bennassar and Grimalt, 2010; Hay, 2017).

Tinea capitis is a contagious dermatophytic infection of the scalp and hair shafts, predominantly affecting children aged 3 to 14 years (Mirmirani and Tucker, 2013; Hillary and Suys, 2014). The infection is characterized by a spectrum of clinical manifestations ranging from non-inflammatory black dot or seborrheic-like lesions to inflammatory forms such as kerion, which may result in permanent hair loss (Souissi et al., 2018; Dei-Cas et al., 2019). These clinical presentations vary depending on the causative organism, the host immune response, and the pattern of hair invasion (Hay, 2017). Common signs include scaly alopecia patches, broken hairs, erythematous papules, and in severe cases, painful nodules and scarring alopecia (Birhanu et al., 2023).

The disease burden of tinea capitis is disproportionately higher in developing countries due to factors such as poverty, poor hygiene, overcrowding, limited access to healthcare, and a general lack of awareness (Ndako et al., 2012). Children are especially vulnerable due to their close-contact play behavior, lower levels of personal hygiene, and increased exposure to contaminated environments and domestic animals (Vishnu Sharma et al., 2015; Hay, 2017). Shared use of combs, towels, and clothing, as well as living in conditions of poor sanitation, further increases the risk of transmission.

The presence of zoophilic dermatophytes, often due to unchecked contact with pets or livestock, adds another dimension to the complexity of tinea capitis epidemiology in rural and semi-urban settings (Nweze, 2010). Nigeria's tropical climate, characterized by high humidity and warmth, creates an ideal environment for fungal proliferation (Yemisi et al., 2019). Several hospital- and community-based studies across Nigeria have reported high rates of dermatophyte infections, with tinea capitis being the most prevalent among children. For example, a study conducted at Lagos University Teaching Hospital recorded a 41% prevalence rate of dermatophytoses, while other studies in states such as Ogun and Abia confirmed similar findings with *Trichophyton mentagrophytes*, *T. rubrum*, and *Microsporum canis* as the common causative agents (Yemisi et al., 2019).

Treatment of tinea capitis typically involves systemic antifungal agents, as topical formulations are often insufficient due to poor scalp penetration. Drugs like griseofulvin, terbinafine, and itraconazole are commonly used, with choice guided by the species of

dermatophyte, the inflammatory severity of the lesion, and the patient's immune and nutritional status (Birhanu et al., 2023). However, the emergence of antifungal resistance—fueled by indiscriminate use of over-the-counter medications and poor treatment compliance—poses a growing public health concern (Fisher et al., 2022; Hossain et al., 2022).

Despite the high burden and public health implications of tinea capitis, there remains a significant knowledge gap regarding its prevalence and associated risk factors, especially in specific regions such as Bauchi North in Bauchi State, Nigeria. This region, like many others in the northeastern part of the country, is characterized by high levels of poverty, limited access to healthcare, and

environmental conditions conducive to the spread of fungal infections (Magaji et al., 2025). Existing data on tinea capitis in the area are sparse, outdated, or generalized, failing to account for local variations in disease patterns. Therefore, this study was conducted to assess the prevalence of tinea capitis among school-aged children in Bauchi North, Bauchi State, Nigeria. The study also aimed to identify key sociodemographic and environmental factors contributing to its transmission. By generating localized data, this study intended to provide insight into the extent of the problem in the region and inform public health interventions focused on improving hygiene practices, early diagnosis, and appropriate treatment of tinea capitis among vulnerable school-age children.

## MATERIALS AND METHODS

### Study Area

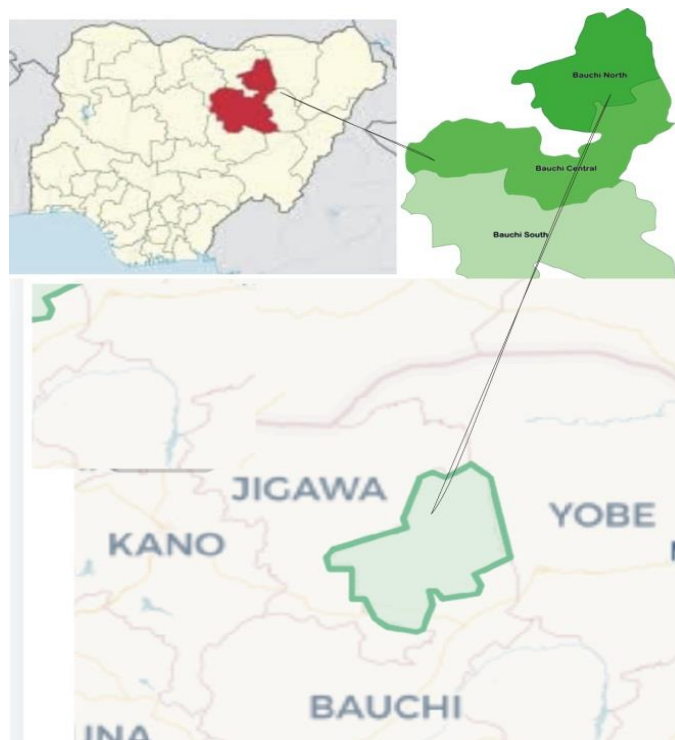


Figure 1: Map of Nigeria Showing the Study Area

This study was conducted in Bauchi North Senatorial District, located in Bauchi State, northeastern Nigeria. The district headquarters is in Azare, within Katagum Local Government Area, which serves as both the administrative and commercial hub. Bauchi North spans approximately 9,717 square kilometers and is predominantly rural, with agriculture as the principal economic activity. The district comprises the following Local Government Areas (LGAs): Katagum, Shira, Giade, Jama'are, Gamawa, Itas-Gadau, and Zaki (Klein et al., 2017).

### Study Design

A cross-sectional study design was adopted to assess the burden of *Tinea capitis* among school-aged children. Data were collected at a single time point from selected primary schools across the senatorial district.

### Study Population

The study population included children aged 3 to 14 years attending seven selected primary schools: Badala Academy, Matsango Primary School, Damno Primary School, Ahmad Turaki Primary School, Imam Malik Primary School, Chilankori Primary School, and Markazush-Shadibiyya Primary School. Children outside the specified age range and those whose parents or guardians declined participation were excluded from the study.

### Sample Size Determination

The sample size was calculated using Cochran's formula:  $n = \frac{z^2 pq}{d^2}$  (Ahmad, 2024), assuming a prevalence of 50% as reported by Idris et al. (2023) and Magaji et al., (2025), with a 5%

margin of error at a 95% confidence level. Based on this calculation, a total of 385 children were enrolled in the study.

### Ethical Considerations

Ethical approval was obtained from the Local Government Education Authorities and the respective school administrations. All procedures adhered strictly to ethical guidelines, ensuring participant rights, privacy, and confidentiality. Written informed consent was obtained from parents or guardians prior to data collection.

### Sample Collection

Scalp and hair samples were collected from the 385 children enrolled in the study. Before collection, the affected areas were disinfected using sterile cotton swabs soaked in 70% ethanol. Samples were then placed in sterile disposable Petri dishes and transported to the Microbiology Laboratory, Sa'adu Zungur University, Gadau, for analysis. Simultaneously, structured questionnaires were distributed through class teachers to gather sociodemographic and risk factor data.

### Detection of Fungal elements

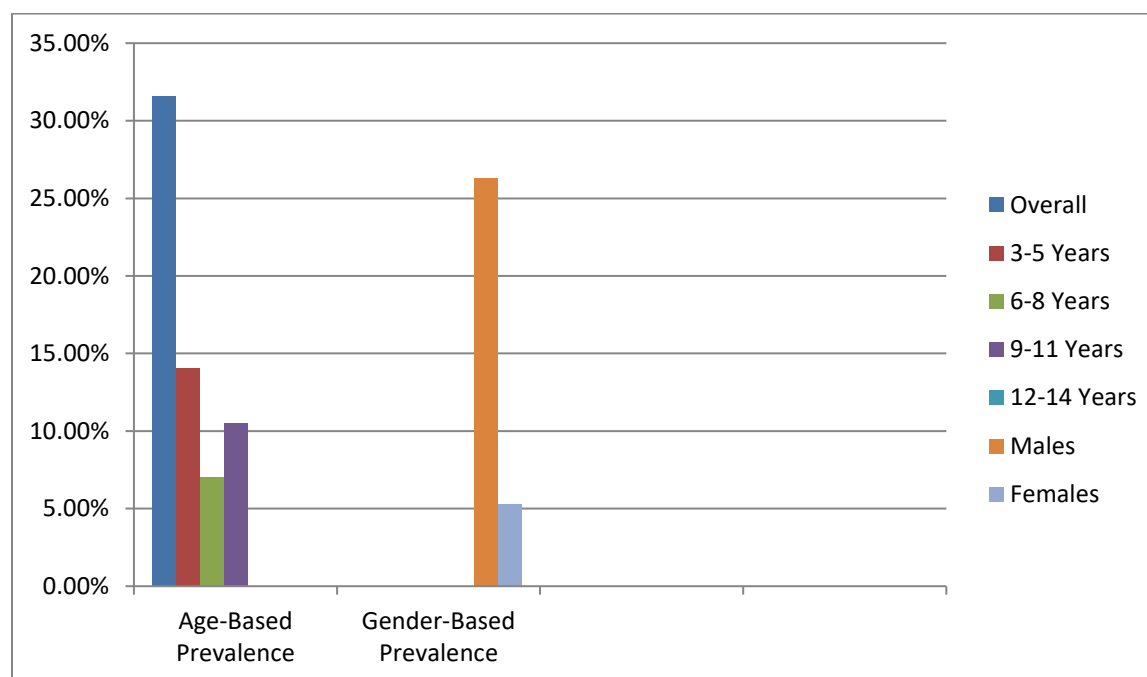
Each specimen was subjected to direct microscopic examination. A portion of the sample was mounted on a slide with a drop of 10% potassium hydroxide (KOH) and allowed to stand for 5 minutes. The slide was then examined under  $\times 10$  and  $\times 40$  objective lenses to detect fungal elements, including arthroconidia, macroconidia, microconidia, and chlamydospores (Larone, 2011).

### Data Analysis

Data were analyzed using SPSS version 23. Descriptive statistics were used to summarize demographic characteristics and prevalence rates. Associations between variables were tested using the Chi-square test where appropriate. Findings were presented in tables and charts to enhance clarity and interpretability.

### RESULTS

The current study revealed that, the overall prevalence of tinea capitis among school-age children in Bauchi North Senatorial District Bauchi state Nigeria was 31.58%. The infection was more prevalent among males (26.32%) compared to females (5.26%). Age-specific analysis showed the highest prevalence in the 3-5 years age group (14.03%), followed by 9-11 years (10.53%) and 6-8 years (7.02%), while no cases were recorded among children aged 12-14 years (Figure 2).



**Figure 2: Prevalence of Tinea capitis Based on Gender and Age of the Children**

Chi-square analysis revealed statistically significant associations ( $p < 0.05$ ) between tinea capitis and several risk factors, including type of residence, in which high prevalence of the infection was noticed among residents of rural areas (26.32%) compared to the urban areas residents (5.26%) ( $X^2 = 26.277$ ;  $P = 0.000$ ).

Socioeconomic status was also a factor significantly associated with the infection ( $X^2 = 32.951$ ;  $P = 0.000$ ), in which high burden of the infection was recorded among low income group (24.56%), followed by middle income ones (5.26%), and high income group (1.75%).

The bathing frequency of the children was among the determinants of the infection ( $X^2 =$



11.203;  $p = 0.004$ ), though, none of the children rarely bathing was found with the infection, high prevalence of 29.82% was seen among children bathing once daily compared to those bathing twice a day (1.75%). Also, regular hair washing was among the significant risk factors ( $X^2 = 23.872$ ;  $p = 0.000$ ), where those who regularly wash their hairs exhibited lower prevalence (5.26%) compared to those who were not (26.32%).

Barbing or salon visits significantly influenced the prevalence of the infection ( $X^2 = 23.019$ ;  $p = 0.000$ ), with high prevalence (26.32%) noticed among children not regularly going for barbing/salon compared to those who were going (5.26%).

Also, disinfection of grooming tools was among the determinants of the infection ( $X^2 = 7.124$ ;  $p = 0.008$ ). Despite this significant association, equal prevalence of 15.79% was noticed among each of those who reported disinfection of grooming tools, and those who did not.

Significant association was also noticed between the infection and children's access to soap or shampoo ( $X^2 = 14.343$ ;  $p = 0.000$ ), where high prevalence (26.32%) was noticed among those lacking access to soap or shampoo, compared to those who have access (5.26%).

Living with multiple children in a house significantly influenced the prevalence of the infection ( $X^2 = 16.710$ ;  $p = 0.000$ ), and the prevalence was higher among those living with multiple children in their respective houses (19.80%) than those who were not (11.78%).

History of scalp itching or scaling was also a crucial determinant of the infection ( $X^2 = 190.731$ ;  $p = 0.000$ ), and interestingly, all of the

positive children (31.58%) experienced itching or scaling of the scalp recently.

Presence of hair loss patches significantly affects the incidence of the infection ( $X^2 = 242.356$ ;  $p = 0.000$ ), where highest prevalence of the infection (29.82%) was seen among those with hair loss patches on their scalp compared to those without (1.75%).

Scalp swelling or pus was also a significant determinant of the infection ( $X^2 = 31.436$ ;  $p = 0.000$ ), and surprisingly, low prevalence of the infection (3.51%) was recorded among children who saw swelling or pus-filled lesions on their scalps compared to those who did not (28.07%).

Also, previous treatment for scalp infection was among the determinants of the infection ( $X^2 = 132.771$ ;  $p = 0.000$ ), in which high prevalence of the infection (19.30%) was seen among those who previously received treatment for scalp infection than those who did not (12.28%).

Pet ownership was also associated with the prevalence of the infection ( $X^2 = 31.212$ ;  $p = 0.000$ ), however, high prevalence (17.54%) was recorded among those with pets compared to those without (14.04%).

Similarly, the study underscored the role of contact with an infected individual to the burden of the infection, in which those with siblings or classmates with similar conditions exhibited higher prevalence (21.05%) than those without (10.53%) ( $X^2 = 18.370$ ;  $p = 0.000$ ).

Sharing of personal grooming items significantly affect the prevalence of the infection ( $X^2 = 10.590$ ;  $p = 0.001$ ). high prevalence (19.30%) was noticed among those using grooming items not on their possessions, compared those who did not (12.28%) (Table 1).

Table 1: Prevalence of tinea capitis in relation to the risk factors of the infection

Variables	Prevalence (%)	$\chi^2$	p-value
Type of residence:			
Rural	26.32	26.277	0.000*
Urban	5.26		
Socioeconomic status			
High income	1.75	32.951	0.000*
Moderate income	5.26		
Low income	24.56		
How often do you bathe?			
Once daily	29.82	11.203	0.004*
Twice daily	1.75		
Occasionally	0.00		
Do you wash your hair regularly?			
Yes	5.26	23.872	0.000*
No	26.32		
Do you go to the barbing/hair salon regularly?			
Yes	5.26	23.019	0.000*
No	26.32		
Are the clippers or tools used on you disinfected before use?			
Yes	15.79	7.124	0.008*
No	15.79		
Do you live in a house with many other children?			
Yes	19.80	16.710	0.000*
No	11.78		
Do you have access to soap or shampoo regularly?			
Yes	5.26	14.343	0.000*
No	26.32		
Have you experienced itching or scaling of the scalp recently?			
Yes	31.58	190.731	0.000*
No	0.00		
Have you noticed patches of hair loss on your scalp?			
Yes	29.82	242.356	0.000*
No	1.75		
Have you seen any swelling or pus-filled lesions on your scalp?			
Yes	3.51	31.436	0.000*
No	28.07		
Have you been treated for any scalp infection before?			
Yes	19.30	132.771	0.000*
No	12.28		
Do you have any pets at home?			
Yes	17.54	31.212	0.000*
No	14.04		
Do any of your siblings or classmates have similar scalp conditions?			
Yes	21.05	18.370	0.000*
No	10.53		
Have you used anyone's hairbrush, hat, or scarf recently?			
Yes	19.30	10.590	0.001*
No	12.28		

"\*" = Significant at  $p < 0.05$ , " $\chi^2$ " = Chi-square

The binary logistic regression analyses identified several factors significantly associated with tinea capitis. Type of residence was one of the predictors of the infection in which rural dwellers had significantly higher odds of infection (OR = 7.600, 95% CI: 3.137-18.410,  $p = 0.000$ ). Also, socioeconomic status of the children was significantly associated with the infection, where high income was found to be protective factor (OR = 0.226, 95% CI: 0.133-0.384,  $p = 0.000$ ).

Regular washing of hairs (OR = 0.307, 95% CI: 0.181-0.521,  $p = 0.000$ ), disinfecting grooming tools (OR = 0.560, 95% CI: 0.365-0.859,  $p = 0.008$ ), and regular visits to salons (OR = 0.288, 95% CI: 0.170-0.487,  $p = 0.000$ ) were among the protective factors.

Crowded living conditions was among the predisposing factors in which living with many

children increased the odds (OR = 2.750, 95% CI: 1.676-4.513,  $p = 0.000$ ). Similarly, lack of regular access to soap or shampoo was associated with higher odds (OR = 3.700, 95% CI: 1.813-7.550,  $p = 0.000$ ), as the hair loss strongly associated with infection (OR = 0.009, 95% CI: 0.004-0.020,  $p = 0.000$ ).

History of treatment of the infection (OR = 0.053, 95% CI: 0.030-0.094,  $p = 0.000$ ), and having no pets (OR = 0.273, 95% CI: 0.171-0.437,  $p = 0.000$ ) were protective against the infection.

Having siblings or classmates with the infection (OR = 0.386, 95% CI: 0.249-0.600,  $p = 0.000$ ), and sharing hairbrushes or scarves (OR = 0.492, 95% CI: 0.320-0.756,  $p = 0.001$ ) were associated with increased risk of the infection (Table 2).

Table 2: Binary logistics regression for the risk factors associated with tinea capitis

Variables	+	-	Total	p-value	OR	Confidence Interval	
						Lower	Upper
Type of residence:							
Rural	105	7	112	0.000*	7.600	3.137	18.410
Urban	21	266	287		1		
Socioeconomic status							
High income	7	14	21	0.000*	0.226	0.133	0.384
Moderate income	21	126	147		0.679	0.264	1.744
Low income	98	133	231		1		
How often do you bathe?							
Once daily	119	231	350	0.627	0.000	0.000	.
Twice daily	7	21	28		1.545	0.639	3.739
Occasionally	0	21	21		1		
Do you wash your hair regularly?							
Yes	21	112	133	0.000*	0.307	0.181	0.521
No	105	161	266		1		
Do you go to the barbing/hair salon regularly?							
Yes	21	112	133	0.000*	0.288	0.170	0.487
No	105	161	266		1		
Are the clippers or tools used on you disinfected before use?							



Yes	63	98	161	0.008*	0.560	0.365	0.859
No	63	175	238		1		
Do you live in a house with many other children?							
Yes	79	231	310	0.000*	2.750	1.676	4.513
No	47	42	89		1		
Do you have access to soap or shampoo regularly?							
Yes	21	14	35		1		
No	105	259	364	0.000*	3.700	1.813	7.550
Have you experienced itching or scaling of the scalp recently?							
Yes	126	70	196	0.994	0.000	0.000	
No	0	203	203		1		
Have you noticed patches of hair loss on your scalp?							
Yes	119	35	154	0.000*	0.009	0.004	0.020
No	7	238	245		1		
Have you seen any swelling or pus-filled lesions on your scalp?							
Yes	14	0	14	0.998	0.000	0.000	.
No	112	273	385		1		
Have you been treated for any scalp infection before?							
Yes	77	21	98	0.000*	0.053	0.030	0.094
No	49	252	301		1		
Do you have any pets at home?							
Yes	70	224	294	0.000*	0.273	0.171	0.437
No	56	49	105		1		
Do any of your siblings or classmates have similar scalp conditions?							
Yes	84	119	203	0.000*	0.386	0.249	0.600
No	42	154	196		1		
Have you used anyone's hairbrush, hat, or scarf recently?							
Yes	77	119	196	0.001*	0.492	0.320	0.756
No	49	154	203		1		

"\*" = Significant at  $p < 0.05$ , "+" = Positive, "-" = Negative, "OR" = Odds ratio

## DISCUSSION

The present study investigated the prevalence and associated risk factors of tinea capitis among school-aged children in Bauchi North Senatorial District, Bauchi State, Nigeria. An overall prevalence of 31.58% was observed, indicating a substantial public health concern in the region. This finding is slightly higher than the 29.03% prevalence reported by

Birhanu *et al.* (2023) and considerably higher than the 15.6% and 15.3% recorded in rural southern Ethiopia (Perez-Tanoira *et al.*, 2016) and Tanzania (Magreth *et al.*, 2020) respectively. However, it is lower than the 41% reported in Lagos, Nigeria (Yemisi *et al.*, 2019). Comparatively, the observed burden of tinea capitis in this study is higher than in several African settings, such as 14.3% in Rivers State, Nigeria (Fienemika *et al.*, 2020), and

23% in studies conducted through systematic reviews and meta-analyses across Africa (Bongomin et al., 2021). These differences may be due to variations in environmental conditions, socioeconomic factors, cultural practices, and healthcare access across different regions.

In Bauchi State, high poverty levels, environmental exposure, and limited access to healthcare, as previously reported (Magaji et al., 2025), may partly explain the high prevalence observed. Furthermore, the role of environmental reservoirs, such as soil and domestic animals, cannot be overlooked in rural and peri-urban settings.

The age-specific prevalence pattern observed, with the highest burden among the 3-5 years age group (14.03%), aligned with previous studies that identified younger children as more susceptible to tinea capitis (Ogunbiyi et al., 2005; Popoola et al., 2006; Perez-Tanoira et al., 2016). This vulnerability may be attributed to closer interpersonal contact, underdeveloped personal hygiene practices, and immature immune responses (Vishnu Sharma et al., 2015; Hay, 2017).

Gender differences were also noted, with males exhibiting a higher prevalence (26.32%) compared to females (5.26%). This observation corroborates findings from studies by Perez-Tanoira et al. (2016), suggesting that sociocultural behaviors and varying hygiene practices between boys and girls may influence infection rates.

Several risk factors were found to be significantly associated with the prevalence of tinea capitis: Children living in rural areas had markedly higher odds of infection compared to urban residents (OR = 7.600; 95% CI: 3.137-18.410;  $p < 0.001$ ). This supports previous

findings by Hogewoning et al. (2011) and Morrell et al. (2011), highlighting the role of rural living conditions, limited access to healthcare, and higher exposure to zoonotic sources.

Similarly, low-income children were disproportionately affected, a trend that echoes the findings of Ndako et al. (2012) and underscores the role of poverty in the epidemiology of tinea capitis. Likewise, infrequent hair washing (OR = 0.307;  $p < 0.001$ ), irregular salon visits (OR = 0.288;  $p < 0.001$ ), and failure to disinfect grooming tools (OR = 0.560;  $p = 0.008$ ) were identified as significant predisposing factors. These observations are consistent with earlier reports linking poor hygiene to higher tinea capitis risk (Lulu et al., 2017; Amare and Lindtjorn, 2021).

Furthermore, the study indicated that, children residing in crowded homes had increased odds of infection (OR = 2.750;  $p < 0.001$ ), supporting the findings by Rebollo et al. (2008) that overcrowding facilitates the spread of dermatophytic infections. Also, children lacking regular access to shampoo or soap were more likely to be infected (OR = 3.700;  $p < 0.001$ ), emphasizing the importance of basic hygiene resources in preventing fungal infections.

Strong association was found between tinea capitis and the presence of scalp itching, scaling, and hair loss patches ( $p < 0.001$ ). Remarkably, all positive cases had a history of recent scalp itching or scaling, highlighting the clinical importance of early symptom recognition.

Pet ownership was associated with an elevated risk ( $p < 0.001$ ), reinforcing the zoonotic potential of dermatophytes, as described by Nweze (2010) and Perez-Tanoira et al. (2016).

Further, having siblings or classmates with similar scalp conditions (OR = 0.386;  $p < 0.001$ ) and sharing grooming items (OR = 0.492;  $p = 0.001$ ) were also significant predictors, consistent with previous reports (Lulekal et al., 2019; Dessie et al., 2022).

Interestingly, some protective factors were also identified. Regular hair washing, regular salon visits, access to soap and shampoo, and prior treatment for scalp infections were associated with reduced odds of tinea capitis, suggesting that both prevention and timely treatment are critical strategies in controlling the spread of infection.

Our findings also support the notion that early identification and treatment of cases, coupled with interventions promoting personal hygiene and reducing household crowding, could significantly curb the transmission of tinea capitis. Health education programs emphasizing regular hair washing, safe grooming practices, and minimizing contact with infected individuals and animals are critical.

## CONCLUSION

This study highlighted the high burden of tinea capitis among school-aged children in Bauchi North Senatorial District, Nigeria, with a prevalence of 31.58%. The infection was significantly associated with modifiable risk factors such as poor hygiene practices, rural residence, overcrowding, low socioeconomic status, and pet ownership. Regular hair washing, access to hygiene materials, and regular visits to barbing salons were found to be protective against the infection.

The findings underscored the urgent need for public health initiatives focused on improving hygiene awareness, providing access to hygiene resources, and encouraging early medical

intervention. Health education programs in schools, communities, and healthcare centers should be prioritized, alongside efforts to improve living conditions in rural areas. Early detection and treatment, coupled with preventive strategies such as regular disinfection of grooming tools and limiting contact with infected individuals or animals, are vital steps toward reducing the burden of tinea capitis among vulnerable populations. Future studies involving a broader geographical scope and molecular identification of causative agents are recommended to further understand the epidemiology and guide more targeted interventions.

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