Original Article

Agents of Dermatophytosis and Associated Risk Factors Among Primary School Children in Malete Kwara State

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ABSTRACT

Dermatophytoses are fungi infections of the skin, hair, and nails commonly known as ringworm or tinea. They have been found to impact negatively on health and well-being of children. This study determined the prevalence, clinical types as well as the etiologic organisms of dermatophyte infection among primary school children aged 4-12 years in Malete community, Kwara State. A descriptive cross-sectional study was carried out among 210 children aged 4-12 years in Malete community in Kwara State. Seventy-three samples were collected from Children with clinically suspected lesions. A portion of each sample examined microscopically for fungal elements using Potassium hydroxide (KOH) and the remaining portion was cultured in tubes of Dermatophyte Test Medium containing chloramphenicol, cycloheximide and gentamicin. Dermatophyte isolates were identified by studying macroscopic and microscopic characteristics of their colonies, and differentiation using urea agar base. The prevalence of clinically suspected dermatophytosis lesion was 34.8% (73/210), 26.2% (55/210) showed fungal elements in KOH while 8.6% (18/210) showed no fungal elements. Six species of dermatophytes belonging to only two of the three genera of dermatophytes were responsible for human infection in the area studied, namely *Trichophyton mentagrophytes* (41.5%) and *Trichophyton verrucosum* (3.1%). The prevalence of dermatophytosis was higher among males 22.4% (47/210) ages 7-9 years. Tinea capitis was predominant accounted for 73.8% of the cases. This study showed that the prevalence of dermatophytosis in the school studied was significant. Therefore, intensive health promotion and education interventions to promote good hygiene practices among school children is recommended.

Keywords: Dermatophytes, Prevalence, Primary school children, Risk factors

INTRODUCTION

Dermatophytoses are fungal infections that may affect skin, nail and nails. The prevalence among primary school children varies by location, but studies show rates from 5% to over 50%.[1,2] Factors like age, gender, and hygiene practices contribute to infection risk. Tinea capitis is the most common type, affecting children's scalp, hair, and skin, and can be linked to factors like poor hygiene, sharing personal items, and contact with animals. Dermatophytes can invade and feed on keratinized substrates such as skin, hair, and nails.[3,4]

The dermatophytes have global distribution, and there are 52 keratin-degrading species divided into nine genera namely; *Trichophyton, Microsporum, Epidermophyton, Arthroderma, Lopophyton, Nannizia, Ctenomyces, Guarromyces,* and *Paraphyton* with *Trichophyton, Epidermophyton* and *Microsporum presently known to infect man*.[5]

The distribution, frequency, and etiological agents of dermatophytes vary according to the geographic region studied, the climatic variations, the socioeconomic level of the population, time of study, the presence of domestic animals and age of the individual.[6]

Children are particularly susceptible to dermatophytic infections because of their poor personal hygiene habits and poor environmental sanitation. As human contact

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among children is more frequent between the ages of 4 and 12 years than in the very early childhood as this age group is similarly at greater risk of contracting infectious diseases[6]. Considering the rural location of the Malete community and the predisposition to dermatophyte infections among primary school children, there is therefore the need to know the prevalence and the associated risk factors.

MATERIALS AND METHODS

Study area

The study was conducted in Malete among community primary school children. Malete is a village situated in Moro local government of Kwara State and is 41km from the centre of Ilorin, the capital city, off the Ilorin/Jebba road. The climate type of this region is tropical savanna and majority of the populace are farmers.

Study design

This descriptive cross-sectional study was conducted among 210 community primary school children aged 4-12 years in Malete over 4-month period. Calculated minimum sample size using prevalence from a previous study,[1] and Fisher's statistical formula was 73. The sample collection procedure was explained to the study participants using the information sheet prepared by the researcher. Each study participant's parent or care-giver was required to sign an informed consent form before being recruited into the study.

The semi-structured precoded questionnaire had sections focusing on the sociodemographic details of the respondents, possible predisposing factors for dermatophytic infections. Physical examination was conducted in a well-lit room and the children were examined thoroughly from head to toe with minimal clothing for the presence of any dermatophytic infection. Diagnosis was made clinically, and appropriate skin scrapings or nail clippings were taken to confirm diagnosis.

Sample collection

A total of 73 samples were collected according to the method described by Taha.[7] Samples from infected skin, nail, and scalp scrapings were collected from selected study participants enrolled in primary schools in Malete. The sites of infection were first cleaned with methylated spirit, and scales from the skin lesions were collected by scraping outwards with a sterile scalpel blade from the edge of the lesion. All samples were collected on a sterile piece of paper (5 cm square). The papers were folded to enclose the specimen, labelled, and transferred to the Department of Medical Microbiology, University of Ilorin Teaching Hospital, for culturing, isolation and identification.

Sample processing

A portion of each sample was examined microscopically for fungal elements using Potassium hydroxide (KOH) and the remaining portion was cultured in tubes of Dermatophyte Test Medium containing chloramphenicol, cycloheximide and gentamicin. Chloramphenicol and gentamycin were the antibiotics used to inhibit bacterial contaminants. Culture plates were incubated at 27^0C for 4 weeks and then examined for the presence of dermatophytes. Macro- and micromorphological studies of cultured colonies were done for the presence of dermatophytes. Dermatophyte isolates were identified by studying macroscopic and microscopic characteristics of their colonies, and differentiated using urea agar base.

Statistical analysis:

The data obtained was entered into Epi Info data version 3 and then transferred to SPSS version 20. Descriptive statistics such as frequency distribution, table, and summary measure produced to explain the study population in connection to pertinent variables. Each independent variable was subjected to a bivariate binary logistic regression analysis to discover statistically significant associated factors. In multivariate binary logistic regressions, variables with a p-value of <0.05 were considered statistically significant.

Ethical Considerations

Ethical approval for this study was obtained from Kwara State Ministry of Health with code number: MOH/KS/EU/777/535. Each study participant's parent or care-giver was required to sign an informed consent form before being recruited into the study.

RESULTS

Out of 210 primary school children aged 4-12 years studied, samples were collected from 73 that had clinically suspected skin diseases, nail and foot infection. The prevalence of dermatophytosis among the primary school children was 34.8% (73/210) as shown in table 1. Clinical samples from 54 (74.0%) school children were both culture and KOH positive. Among the study population, fungal elements were neither detected in KOH nor showed visible fungal growth in culture in 7 (9.6%) samples despite being obtained from lesions compatible with dermatophytosis. The primary school children age ranged 7-9 years, 12 (44.4%) and male gender 19 (70.0%) were more predisposed to *Trichophyton metagrophytes* while the scalp and nails, site of lesion were predisposed to all the fungal isolates except *Microsporum gypseum* that had predilection for scalp only as stated in table 2..

Majority of the study participants with presence of dermatophytes were within the age of 7-9 years (38.5%). There was significant association of age (p=0.001) with prevalence of Dermatophytosis at p<0.05. More than half of the study participants that showed presence of dermatophytes were male (72.3%). There was significant association of gender (p=0.001) with prevalence of Dermatophytosis at p<0.05. Majority of samples that showed growth for the presence of dermatophytes were collected from scalp (73.8%) and lowest from feet (3.1%). There was significant association of Site of lesion collection (p=0.001) with prevalence of Dermatophytosis at p<0.05 as shown in table 3.

Table 1: Fungal isolates in Culture and Direct microscopy using Potassium hydroxide solution (KOH)

Sample	Culture	Direct microscopy in KOH
Presence of fungal isolat es	65 (89.0%)	55 (75.0%)
Absence of fungal isolates	8 (11.0%)	18 (25.0%)
Total	73 (100.0%)	73 (100.0%)

Table 2: Fungal Isolates Distribution and Age, Gender and Site of lesion

Variables	*Microsporum ferrugineum*	*Trichophyton mentagrophytes*	*Trichophyton rubrum*	*Microsporum audouini*	*Microsporum gypseum*	*Trichophyton verucosum*
Age: 1-3 yrs	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (24.9%)	0 (0.0%)	0 (0.0%)
4-6 yrs	5 (50.0%)	7 (26.0%)	0 (0.0%)	2 (16.7%)	0 (0.0%)	0 0.0%)
7-9 yrs	3 (30.0%)	12 (44.4%)	3 (27.3%)	5 (41.7%)	1 (33.3%)	1 (50.0%)
10-12 yrs	2 (20.0%)	8 (29.6%)	8 (72.7%)	2 (66.7%)	2 (66.7%)	1 (50.0%)
Male	9 (80.0%)	19 (70.0%)	8 (72.7%)	8 (66.7%)	2 (66.7%)	1 (50.0%)
Female	1 (10.0%)	8 (29.6%)	3 (27.3%)	4 (33.3%)	1 (33.3%)	1 (50.0%)
Site of Lesion:		22 (81.5%)	9 (81.8%)	6 (50.0%)	3 (100.0%)	0 0.0%)
Scalp	8 (80.0%)					
Body	0 (0.0%)	3 (11.1%)	1 (9.1%)	6 (50.0%)	0 0.0%)	1 (50.0%)
Nail	2(20.0%)	1 (3.7%)	0 0.0%)	0 (0.0%)	0 0.0%)	1 (50.0%)
Feet	0 0.0%)	1 (3.7%)	1 (9.1%)	0 0.0%)	0 0.0%)	0 (0.0%)

Table 3: Socio-demographic and associated risk factors to prevalence of dermatophtosis among the study participants.

Variables	Presence of Growth	X^2	P-value	Remarks
	Freq. (%) N=65			
Age (years)		18.63	0.001	S
1-3	3(4.6)			
4-6	14(21.5)			
7-9	25(38.5)			
10-12	23(35.4)			
Gender		12.94	0.001	S
Male	47(72.3)			
Female	18(27.7)			
Site of lesion collection		85.46	0.001	S
Scalp	48(73.8)			
Body	11(16.9)			
Nail	4(6.2)			
Feet	2(3.1)			
Presence of pet		0.39	0.535	NS
Yes	30(46.2)			
No	35(53.8)			
If yes, type of pet present (n=30)		11.6	0.041	S
Goat	9(30.0)			
Dog	7(23.3)			
Chicken	3(10.0)			
Cat	1(3.3)			
Goat and cat	8(26.7)			
Goat and dog	2(6.7)			
Shavings/hair making		32.05	0.001	S
Public clipper	34(52.3)			
Private clipper	4(6.2)			
Blade	15(23.1)			
Salon	10(15.4)			
Frequency of cloth changing		0.14	0.709	NS
Daily	34(52.3)			
Not daily	31(47.7)			

S=Significance; NS=Non significance

DISCUSSION

The prevalence of dermatophytic infections among primary school pupils in Malete was 34.8%. The prevalence in the present study is similar to the findings of Adefemi[1] who found prevalence of 29.6% in prevalence of dermatophytes among primary school pupil, Oke-oyi, Kwara State. The prevalence rate in this study is also similar to the findings of Olaide[2] and Dike-Ndudim[8] who reported prevalence rates of 35%, and 31.6% respectively. The prevalence rate reported in this study was higher than Alex[9] and Ezihe[10] who reported the prevalence rate of 9.6%, 6.6% respectively but the prevalence of 34.8% in this study was lower than the findings of Ogunbiyi[11] and Oyediji[12] who reported prevalence rate of 40.4%, and 49.5% respectively in their studies. This may be attributed to variation in climatic conditions, socioeconomic status, lifestyle and environmental conditions of the areas being studied.

Currently, the diagnosis of dermatophytosis in developing countries is confirmed by clinical examination and using microscopic and culture methods as conventional diagnostic tools.[13,14,15] In this study, clinical samples from 54 (74.0%) were both culture and KOH positive which was similar to the findings of other researchers who reported culture positivity range from 36.0% to 66.7% and KOH microscopy positivity range from 35.6% to 100.0%.[16,17,18,19,20]

The most common dermatophytes found in this study was *Trichophyton mentagrophytes* (41.5%). *Trichophyton mentagrophytes* was found common among age 7-9 years (44.4%), males (70.4%) and on the scalp (81.5%) in this study. The fungus is said to be cosmopolitan, and is one of the most common dermatophytes infecting man and animals.[21] Infections in humans are often acquired due to contact with infected soil and domestic animals like cat or dog. These animals were significantly found to be risk factors in this study and it was also alluded to by a previous researcher.[1] It was believed that the preponderance of T. mentagrophytes might have been acquired through this mode according to the findings of Uneke[22] that found *Trichophyton mentagrophytes* to be predominant isolate from the healthy scalps of children in two primary schools in Basra. Ezeronye[23] In a recent study in Cross river State, Nigeria, *Trichophyton mentagrophytes was found* as the second most common species of isolate from tinea capitis lesions.

This present study showed age is associated with prevalence of dermatophytosis. It is common among age 7-9 years (38.5%), followed by those within the age of 10-12 years (35.4%), 4-6 years (21.5%) and lowest among 1-3 years (4.6%). The result of this work is in agreement with the work of Ogunbiyi[11] and Popoola,[24] that dermatophytosis with dermatophyte species was most prevalent in children between ages 7 and 10. The age predilection is believed to result from fungistatic properties of the fatty acids of short and medium chains in post pubertal sebum[23,25] . It is expected that the younger the age, the poorer will be the hygiene, and the more likely it is to contract infectious diseases. This present study showed age was significantly associated with prevalence of dermatophytosis.

Majority were male (72.3%) and females were 27.7%. This is comparable with similar studies which showed that prevalence of dermatophytosis was higher in males than in females.[24,26,10] The higher prevalence in boys than in girls may be attributed to the playing habits of boys as compared to girls which made them to be more frequently exposed to dermatophytes. The fact that boys visit barbers more often can also contribute to this higher prevalence, since barbers instruments have been noted to play a role in the spread of these infections.[27] As dermatophytic infection relate to personal hygiene cleanliness, females appear to be more hygienic than males as they pay more attention to their outlook, especially, as they approach teenage age.[1]

In this present study, site of lesion collection was found to be significant with prevalence of dermatophytosis. Highest prevalence was found on scalp 73.8%, followed by Body (16.9%), Nail (6.2%) and lowest from feet (3.1%). The higher prevalence of scalp infection (Tinea capitis) agrees with previous researchers that reported Tinea capitis as an important clinical problem widely distributed throughout the world especially among children.[28,29]

In this study, presence of pet was not associated with prevalence of dermatophytosis as many people did not have pets in their houses. However, type of pet was found to be significantly associated with prevalence of dermatophytosis. A thriving infection transmission link was suspected to have existed between the pupils and their pets, or domesticated animals in their homes and neighborhoods. This is similar to a study done by Amen and Okolo,[30] which found a strong link between dermatophytosis and domestic animals. A similar study also found that the overwhelming majority of the children who had tinea capitis had unlimited close contact with goats, sheep, and dogs that roam around and are not kept in closed pens.[31] The practice of rearing free-range and stray animals around the home and neighborhoods, which subsequently leads to the easy transmission of zoophilic tinea capitis, is further fostered in the cultural belief that

the rearing of animals, especially free-range animals, keeps away evil from their owners.[32]

Shavings or hair making was found to be associated with the prevalence of dermatophytosis. Majority of study participants with presence of dermatophytes made use of public clipper (52.3%), followed by those who made use of blade (23.1), salon (15.4%) and lowest from those who use private clipper (6.2%). The place of barbing also presented an increased risk in our study, as noted in previous studies.[33] People who patronized local barbers were significantly infected compared with those who barbed at the salon or used their personal clippers[34] that may the reason for higher prevalence of tinea capitis in the study as well as the higher prevalence among boys.

Changing of clothes was not associated with prevalence of dermatophytosis as majority changed their clothes daily. In contrast to this study, Afolabi[32] found association between the infection and factors such as bathing with soap, irregular changing of uniform. For these reasons, some school teachers conduct strict hygiene inspection, inspecting pupils for the presence of lesions and enforce the frequent and proper washing of heads and handwashing practices. Lower prevalence of the infection has been observed in schools where the hygiene inspection intervention was practiced.[35]

CONCLUSION

This study showed that the prevalence of dermatophytic infections among primary school pupils in Malete was high, *T. mentagrophytes* being the commonest dermatophyte isolated. Age, sex, site of lesion collection, types of pets and shavings/hair making were identifiable associated factors with prevalence of dermatophytosis. Public awareness about the disease and proper hygiene should be encouraged among the populace.

RECOMMENDATION

Health promotion and education interventions to promote good hygiene practices among school children, including the early detection and treatment of dermatophytosis among school children is recommended. There should be promotion of routine veterinary checks for pets and domesticated animals, for the early detection and treatment of the infection.

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