Prevalence of Dermatophytes Among Primary School Children in Khana Local Government Area, Rivers State.

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ABSTRACT

Dermatophyte infections represent a significant public health concern, particularly among school-aged children worldwide, including Nigeria. The objective of this study was to assess the prevalence of dermatophyte infections in school children residing in the Khana Local Government Area of Rivers State, Nigeria. A total of eighty (80) samples were obtained from these children through scrapings of the scalp and skin. These specimens were inoculated onto Sabouraud Dextrose Agar (SDA) utilizing standardized protocols for fungal culture, isolation, and identification. A total of twenty-seven (27) positive growths were identified from both scalp and skin samples alike. The isolated species included Microsporium spp., with prevalence rates of 19.0% from scalp samples and 13.7% from skin samples; Trichophyton spp., showing prevalence rates of 13.7% from scalp samples and 5.0% from skin; and Epidermophyton spp., which yielded no isolates from scalp specimens but contributed a prevalence rate of 13% from skin samples ($p<0.05$). Among the dermatophytes identified, Microsporium spp. accounted for the highest number of isolates, followed by Trichophyton spp., with Epidermophyton spp. being least prevalent. The findings underscore that school children in rural areas are particularly susceptible to dermatophytosis; therefore, it is imperative to direct interventions towards addressing this escalating public health issue within this demographic group.

INTRODUCTION

Background

The incidence dermatophytosis is on a high increase leading to infectious superficial mycoses in patients especially among school children in rural communities (Ndako *et al*., 2012). Human infection particularly those involving the skin and surface of the mucosa constitute major challenges in tropical and subtropical regions of the world especially in developing countries. Dermatophytes or tinea or ringworm is a prevalence form of fungal infection caused by a group of keratinophilic fungi. As dermatophytes infect and thrive in keratinized tissues like hair, skin, and nails (Segal, *et al*, 2021).

The organisms have the potential to invade keratinized tissues of human and animals and therefore cause a disease commonly referred to as dermatophytosis which is the most common human contagious fungal infection. In the past years, researchers have identified the risen incidence of dermatophytosis worldwide. Reports have identified some factors such humid weather, climate change, overcrowding, poor hygienic conditions, poor nutrition and immunity as predisposing factors for the organism, (Gnat *et al*., 2019; Mushtag *et al*., 2020). These factors are very common in developing countries including India and Nigeria, and contribute immensely to the prevalence of mycoses that are of dermatophytes origin. A report on prevalence of dermatophytes in children showed that children in the rural area are more exposed to the infection than children in the urban area, (Adefemi *et al*., 2011). Currently, the challenge of emerging drug-resistant pathogens has been reported to be on the increase, (Singh *et al.,* 2018; Rudramurthy *et al*., 2018). Similarly, another study also assesses the effect of some plants extracts on dermatophytes infection and found that local plants could inhibit the growth and activity of the organisms, Tamnyegia *et al*., (2023). This study helped to identify vulnerable population so that control efforts are channeled toward target population at risk of the infection.

In recent years, dermatophyte infections have emerged as a significant public health concern, particularly among vulnerable populations such as schoolchildren. These infections are primarily caused by fungi that thrive in keratin-rich environments. The most commonly implicated genera of these fungi are Trichophyton and Microsporum, with varying prevalence depending on

geographic and socio-economic factors. Understanding the distribution and dynamics of these pathogens is critical for developing effective prevention and management strategies.

This investigation explores the prevalence of different species of dermatophytes in schoolchildren, revealing an unexpected dominance of some species of organisms causing dermatophytosis. The implications of this study extend beyond mere statistical differences; they call attention to the necessity for localized epidemiological research tailored to specific communities. By gaining insights into which pathogens are most prevalent in particular regions or demographic groups, public health officials can design more effective intervention strategies aimed at reducing transmission rates and improving overall community health outcomes. Given these findings' potential impact on public health policy and practice, there is an urgent need for further localized studies to guide targeted interventions effectively tailored to address community-specific challenges related to dermatophytic infections.

Material and Methods

Sample Collection and Culture

A convenient sampling technique were employed, with a total number of eighty (80) samples collected both from the head and skin of Primary and Secondary School Children by scraping the surface of the affected area into a clean piece of colored paper of about 5cm square. Samples were transported to Medical Microbiology Laboratory, Rivers State University for processing as described by Cheesbrough, (2016).

Identification of Dermatophytes

Colony characteristic on Sabouraud dextrose agar (SGA) and microscopic morphology that include the examination of two types of conidia; micro-conidia (presence or absence); macro-conidia (surface of the wall, rough verses smooth; number of septa and size of the conidium) were employed. Microscopic examinations of fungal culture were done to aid in proper identification of the organism. These include wet preparation and examination using lacto-phenol

cotton blue and KOH as described by Cheesbrough, (2006). In addition, colony features such as pigmentation (surface and reverse sides), topography (flat, heaped, regularly, or irregularly folded), texture (yeast-like, glabrous, powdery, granular, velvety, or cottony), and rate of growth (slow or rapid) also aided in identification (Kamal *et. al*., 2012.)

Statistical Analysis

Microsoft Excel and Statistical Package for Social Science (SPSS) for statistical analysis were deployed for data analysis. SPSS version 21 was used to analyze the data for mean, standard deviation, percentage, prevalence and Chi square. Test of significance was performed at 0.05 alpha levels.

Results

A total of eighty (80) samples were procured from the scalp and skin of primary and secondary school children. The data presented in Table 1 details the number of isolates obtained through culture, along with their respective collection sites. Among the 27 cultures, sixteen (16) Microsporium spp. were isolated from scalp samples, yielding a prevalence rate of 0.190 (19.0%), while eleven (11) isolates came from skin samples, resulting in a prevalence of 0.137 (13.7%). Furthermore, eleven (11) Trichophyton spp. were identified in scalp cultures with a prevalence of 0.137 (13.7%), compared to four (4) isolates from the skin with a prevalence of 0.05 (5.0%). No Epidermophyton spp. were detected in head samples; however, eleven (11) isolates were recovered from skin specimens, corresponding to a prevalence rate of 0.137 (13.7%). Additionally, twenty-seven samples did not yield any growth of dermatophytes, representing 33.3% (or 0.333) of the total number analyzed.

Table 1: Demographic characteristics of specimens Isolated

Characteristics	Number	Prevalence	% Prevalence	X2	P value	Remark
Result on Isolates						
Growth						
Head	27	0.333	33.3%	0.0001	>0.9999	NS
Skin	27	0.333	33.3%			
No growth						
Head	23	0.286	28.6%	0.01639	0.8981	NS
Skin	3	0.048	4.8%			

Key: X^2=Chisquare, % =percentage

Table 2: Demographic characteristics of specimens Isolated from each sample

Dermatophytes Isolates	Number	Prevalence	% Prevalence	X2	P value	Remark
Microsporum spp						
Head	16	0.190	19.0%	0.02068	0.9832	NS
Skin	11	0.137	13.7%			
Trichophyton spp						
Head	11	0.137	13.7%			
Skin	4	0.05	5.0%			
Epidermiphyton spp						
Head	0	0	0.0%			
Skin	11	0.137	13.7%			
No growth	27	0.333	33.3%			

Key: X^2=Chisquare, % =percentage

Discussion

Dermatophyte infections are commonly isolated from individuals, particularly among pediatric populations. This study provides evidence that dermatophytes can be cultivated on Sabouraud Dextrose Agar (SDA) and successfully isolated from infected areas of the scalp and skin of schoolchildren. As illustrated in Table 1, out of a total of 80 samples collected, 52 (41.6%) exhibited significant growth indicative of dermatophyte presence, while the remaining 48 samples (38.4%) did not show any fungal growth.

In comparison to this study, Adefemi *et al*. (2011) reported a notably low prevalence rate; specifically, out of 602 samples analyzed, only 30 demonstrated positive growth for dermatophytes on SDA. The rest were identified as non-dermatophytic fungi. This discrepancy in findings highlights the variability in dermatophyte infection rates across different studies and locales.

Additionally, Aliero *et al*. (2013) conducted similar research in Kebbi State, Nigeria, employing the same culture medium to isolate dermatophytes from schoolchildren. Their findings revealed that among 460 samples examined, a substantial proportion, 400 samples (86.97%), yielded significant fungal growth at an alpha level of $p<0.05$, whereas 60 samples (13.04%) showed no evidence of fungal activity at all.

The marked variations in these studies' growth rates can be attributed to several factors as discussed by scholars such as Kauffman *et al*., (2007), who emphasize geographical differences affecting pathogenic distributions due to climate-related factors such as temperature and humidity levels conducive to fungal proliferation, and Jones *et al*., (2012), who note that pH levels play a crucial role since many fungi thrive optimally at elevated pH values.

Furthermore, considering the highly contagious nature of dermatophytes, as highlighted by Gupta & Jain (2009), the interactions among pupils within overcrowded classrooms may significantly facilitate transmission dynamics compounded by inadequate management within educational systems lacking sufficient resources or health education initiatives aimed at preventing infections.

The convergence of environmental conditions alongside social dynamics underscores the necessity for targeted public health interventions aimed at reducing prevalence rates through improved hygiene practices and educational programs focusing on awareness about transmission pathways associated with dermatophytic infections.

The infection by dermatophytes has been extensively investigated by researchers globally, revealing a predominance of Trichophyton spp. among various isolated species in both pediatric and adult populations. According to Havlickova *et al*. (2008), the majority of superficial mycoses affecting the skin stem from 5 to 6 key species of dermatophytes, with Trichophyton spp. being the most frequently encountered. Complementing this finding, Adefemi *et al*. (2019) reported the isolation of diverse species across two genera of dermatophytes in their study.

Further corroborating these observations, Ndako *et al*. (2012) noted that Trichophyton spp. emerged as the most prevalent among isolated dermatophyte strains, followed closely by Microsporum spp. Similarly, Aliero *et al*. (2013) identified seven distinct species from these two genera within samples obtained from school-aged children.

In contrast to previous reports that predominantly identified Trichophyton as the leading dermatophytic pathogen, our current study, illustrated in Table 2, found three genera of dermatophytes isolated from samples collected from schoolchildren: Microsporium spp. (33.3%), Trichophyton spp. (19.1%), and Epidermophyton spp. (13.7%). Notably, Microsporium was observed as the most prevalent isolate in this context.

This deviation from earlier findings may be attributed to several factors including geographical variances, local socio-economic conditions, and cultural practices that can influence infection prevalence within specific regions or populations. For example, Tinea pedis (athlete's foot) is notably more prevalent in developed nations compared to emerging economies and is primarily associated with anthropophilic strains such as Trichophyton rubrum; conversely, scalp infections such as Tinea capitis are more frequently caused by T .soudanense or M .audouinii in lower-income countries.

The implications for public health underscore the necessity for localized epidemiological assessments that consider these variations when developing targeted interventions aimed at

controlling and preventing dermatophytic infections across different demographics and environmental contexts.

Conclusion

This investigation identifies a notable prevalence of Microsporium spp. (33.3%) among dermatophyte isolates in schoolchildren, deviating from earlier research that predominantly indicated *Trichophyton spp*. as the primary culprit. The observed variation may be attributed to geographical and socio-economic influences on infection dynamics. These findings underscore the critical need for localized epidemiological assessments to inform tailored public health strategies aimed at the management and prevention of dermatophytic infections within specific communities.

References

Adefemi, S.A., Odeigah, L.O. & Alabi, K.M. (2011). Prevalence of dermatophytosis among primary school children in Oke-oyi community of Kwara State. *Nigerian Journal of Clinical Practice*, 14(1) 23-8.

Aliero, A.A., Shehu, K., Manga, S.S. & Bagudo, A.I. (2013). Prevalence of dermatophytesis among school children in Kebbi State, Nigeria. *Equity Journal of Science and Technology*, 1(1)1-5.

Cheesbrough M.District Laboratory Practice in Tropical Countries. 2nd Ed. Cambridge University Press: The Edinburgh Building. 2006.

Gnat, S., Nowakiewicz, A., Lagowski, D., Zieba, P., (2019). Host and pathogen dependent susceptibility and predisposition to dermatophytosis. Journal of Medical Microbiology, 68, 823-836.

Havlickova, B., Czaika, V.A. & Markus, F. M. (2008).Epidemiological trends in skin mycoses worldwide. *Journal of Mycoses*, 51(4):2–15.

Kamal, R., A., Joshi, R.N., Sharma, C., Surain, P., & Aneja, A. (2012). Biodiversity of Dermatophytes: An Overview.

Mushtaq, S., Faizi, N., Amin, S.S. and Adil, M. (2020). Impact on quality of life in patients with dermatophytosis. *Australias Journal of Dermatology*. 61, 184-188.

Ndako, J.A., Osemwegie, O.O., Spencer T.H., Olopade, B.K, Yunusa, G.A, & Banda, J. (2012). Prevalence of dermatophytes and other associated Fungi among school children. *Global Advanced Research Journal of Medicine and Medical Sciences,* 1(3) 049-056

Rudramurthy, S. M., Shankarnarayan, S. A., Dogra, S., Shaw, D., Mushtaq, K., Paul, R. A., Narang, T., & Chakrabarti, A. (2018). Mutation in the Squalene Epoxidase Gene of Trichophyton interdigitale and Trichophyton rubrum Associated with Allylamine Resistance. *Antimicrobial agents and chemotherapy*, *62*(5), e02522-17.

Segal E, Elad D. Human and Zoonotic Dermatophytoses: Epidemiological Aspects. Front Microbiol. 2021;12:713532. pmid:34421872

Singh, A., Masih, A., Khurana, A., Singh, P. K., Gupta, M., Hagen, F., Meis, J. F., & Chowdhary, A. (2018). High terbinafine resistance in Trichophyton interdigitale isolates in Delhi, India harbouring mutations in the squalene epoxidase gene. *Mycoses*, *61*(7), 477–484.

Tamnyegia, C. J., Nwokah, E. G., and Ollor, A.O. (2023). Assessment of Antifungal potential of selected plants extracts on human dermatophytes. *Journal of Clinical and Biomedical Research,* 5(5) 1-5.