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Dermatophytosis in Western Africa: A Review

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Abstract: Dermatophytic fungal infections are one of the most common infectious diseases in the world and are among the most commonly diagnosed skin diseases in Africa. They are caused by several dermatophyte species made up of three genera: *Trichophyton*, *Microsporum* and *Epidermophyton*. The pathogen spectrum and the clinical manifestations are totally different from those seen in other continents. The hot and humid environment in Africa is probably the major reason for their high prevalence. In this era of rapid movement from one continent to another and the increasing mobility of humans, agents of dermatophytic infections can no longer be said to be restricted within a given geographical area. This implies that an infection contracted in one part of the world may become manifest in another country where the etiological agent is not normally found. Therefore, updating our knowledge of the geographical distribution of the predominant causative agents of dermatophytosis will provide a better understanding of the risk factors and future epidemiologic trends. This review discusses the clinical signs and manifestations of dermatophytoses and attempts to summarize the current epidemiological trends on dermatomycosis of glabrous skin in Western Africa.

Key words: Dermatophytosis, Western Africa, fungal infections, dermatophytes, epidemiology

INTRODUCTION

Dermatophytosis is caused by dermatophytes which comprise a group of closely related fungi made up of three genera: *Trichophyton*, *Microsporum* and *Epidermophyton* (Weitzmann and Summerbell, 1995; Emmons, 1934). They have the ability to invade the stratum corneum of the epidermis and keratinized tissues derived from it, such as skin, hair and nail of humans and other animals (Weitzmann and Summerbell, 1995). It is one of the most common cutaneous infections all over the world (Ameen, 2010; Nweze and Okafor, 2005). They cause superficial fungal infections that pose public health problems to man and animals (Havlickova *et al.*, 2008). Dermatophyte infections can be disfiguring and recurrent and generally need long-term treatment with antifungal agents (Nweze *et al.*, 2007).

In recent times, infections caused by dermatophytes have assumed greater significance. The increasing number of patients with immunocompromised states, such as AIDS, diabetes mellitus, cancer and organ transplantation, has given these infections more prominence (Berg *et al.*, 2007; Nir-Paz *et al.*, 2003; Smith and Stiller, 1997). Infact, it has been estimated that 20 to 25% of the world's population are infected by dermatophytes and the incidence continues to increase on a steady basis (Male, 1990). The causative species vary with geographic region and vice versa (Nweze, 2001, 2005, 2006; Nweze and Okafor, 2005, 2007; Ngwogu and Otokunefor, 2007). However, the epidemiology of

dermatophyte infection is affected by migration pattern, increase in tourism, locality and changes in socioeconomic condition of the people.

Dermatophytes are known to grow best in warm and humid environments and are, therefore, more common in tropical and subtropical regions and this probably explains why they are very common in Africa. For instance, some species of dermatophytes such as *Trichophyton mentagrophytes* var. *interdigitale*, *Microsporum canis*, *Epidermophyton floccosum* and *Trichophyton rubrum* are distributed all over the world. However, other species probably have partial geographic restriction. For example, *Trichophyton schoenleinii* is found in Africa and Eurasia while *Trichophyton soudanense* is also restricted within Africa (Weitzmann and Summerbell, 1995). Others are *Trichophyton violaceum* which are associated to Asia, Africa and Europe and *Trichophyton concentricum* is known to be common in the Far East, India and the Pacifics (Ameen, 2010).

There are several known clinical types of dermatophytoses. This review will discuss them in more details in the subsequent sections. However, in Africa and several other countries in Latin America and the Middle East, there is a kind of variability and geographical/regional associations in the pattern of dermatophytic infections. For instance, tinea capitis is known to be very common in Western Africa especially among children and several species of dermatophytes are known to be responsible. Tinea cruris, tinea pedis, tinea

corporis and tinea unguium are caused by *T. rubrum* in many urban areas of developing countries (Hernandez-Salazar *et al.*, 2007) and even in developed countries (Borman *et al.*, 2007; Foster *et al.*, 2004). *Microsporum audouinii* is the predominant dermatophyte species in many parts of Africa. *T. violaceum* is reportedly endemic in several parts of South and Northern Africa and *T. soudanense* in central Northwestern parts of Africa (Ellabib *et al.*, 2002; Morar *et al.*, 2004; Woldeamanuel *et al.*, 2005). Conversely, *M. canis* predominates other dermatophytes in Southern and Central European countries as the most common cause of tinea capitis while *T. mentagrophytes* and *T. rubrum* are the cause of increasing cases of tinea unguium and pedis, respectively (Tao-Xiang *et al.*, 2005; Tan, 2005).

CLINICAL SIGNS AND MANIFESTATIONS

Dermatophytes typically do not affect the mucus membranes but rather affect the keratinized tissues. They grow on nails, hairs and the outer layer of the skin of both man and other animals. Although, the clinical signs of dermatophytoses may vary depending on the affected region of the body, pruritis is the most common symptom in humans. The lesions on the skin are often characterized by inflammation. Severity of the lesions is often obvious at the edges. Scaling, erythema and sometimes, blister formation are evident. This results in clinical ring worm formation as seen in tinea corporis often resembling a central clearance. Hair loss often results, especially on the facial hair and the scalp.

There are three ecological groups of dermatophytes: anthropophilic (mostly associated with humans), zoophilic (associated with animals) and geophilic (found in the soil) (Ajello, 1962; Georg, 1960). Anthropophilic dermatophytes produce fewer lesions in humans compared to geophilic or zoophilic forms. Generally, speaking, dermatophytic infections in humans are referred to as tinea infections and are consequently named with specific reference to the area of the body involved (Weitzmann and Summerbell, 1995).

One of the foremost clinical manifestations of dermatophytic infection is tinea capitis. It is a dermatophytic infection of the hair and the scalp and begins with a small papule which spreads to form irregular and scaly forms of alopecia. Typical cases mostly result in the enlargement of cervical and occipital lymph nodes. Sometimes, a boggy inflammatory mass known as a kerion is formed. This is common in children worldwide, especially in African countries (Macura, 1993). Clinical presentation depends on the etiology. However, three kinds are recognized: non-inflammatory, inflammatory or

black dot type. The non-inflammatory form is most commonly caused by *M. audouinii* or *M. ferrugineum* and usually begins as a small erythematous papule surrounding a single hair shaft, which spreads centrifugally to other hairs. The hair turns grey following scaling. The inflammatory type is usually associated with zoophilic or geophilic dermatophytes such as *M. canis* and *M. gypseum*, respectively. Black dot tinea capitis is caused by *T. tonsurans* or *T. violaceum*, *T. verrucosum* is highly contagious and virulent and is the only dermatophyte able to thrive at 37°C. Tinea capitis infections caused by zoophilic dermatophytes usually result in suppurative lesions. It is widespread and a well-known occupational disease especially among cattle keepers. Several species of dermatophytes have been recovered from tinea capitis infections. They include *M. audouinii*, *M. canis*, *T. tonsurans* and *T. mentagrophytes*. Others are, *T. schoenleinii*, *T. soudanense*, *T. verrucosum*, *T. violaceum*, *M. ferrugineum*, *M. gypseum*, *M. nanum*, *M. persicolor* and *T. megninii* (Weitzmann and Summerbell, 1995).

Tinea corporis affects the trunk, especially in exposed areas like the abdomen or limbs, causing red patches. It is more common in children than in adults and occurs most frequently in hot climates similar to that found in many African countries (Macura, 1993). Tinea corporis often referred to as ringworm, is characterized by single or sometimes multiple scaly lesion, occurs on the trunk, extremities and face of humans. The edge of the lesions is also elevated, scaly and erythematous with sharp margin and central clearing. Follicular papules, pustules or vesicles may be found on the borders of the lesion. Lesions may be variably pruritic. Dermatophyte infection affecting nearly the entire integument is referred to as tinea corporis generalisata. A generalised dermatophytosis caused by *T. rubrum* can occur as a result of wrong diagnosis or treatment. Misread tinea corporis generalisata caused by *T. rubrum* is named tinea incognita. Zoophilic and anthropophilic dermatophytes are common cause of dermatophytic infections in children and on the neck and wrists of adults in contact with the infected child. Tinea corporis is most times often the result of chronic infection with *T. rubrum*, an anthropophilic dermatophyte. Untreated tinea corporis infections could resolve in a couple of months especially when it is caused by a geophilic or zoophilic dermatophyte. Most common agents include: *M. canis*, *M. tonsurans*, *T. verrucosum* and *T. rubrum*. Others are *E. floccosum*, *M. audouinii*, *M. gypseum*, *M. persicolor*, *T. equinum*, *T. mentagrophytes*, *T. raubitschekii*, *T. schoenleinii*, *T. violaceum* and *M. nanum*.

Tinea imbricata is a specialized manifestation of tinea corporis caused only by *T. concentricum*. It is chronic and usually characterized by concentric rings of overlapping scales scattered throughout the body. It is geographically restricted to certain areas of the Pacific islands of Oceania, Southeast Asia, Mexico and Central and South America (Rippon, 1988).

Tinea faciei is seen on the face especially on the non-bearded areas. The lesions are mostly pruritic with itching and with burning sensation. Exposure to sunlight could make infected cases worse due to itching and burning. Some lesions resemble those of tinea corporis while others may have little or no scaling or raised edges. Tinea faciei is always confused with other skin diseases of the face especially in atypical cases. Most common agents include *T. tonsurans*, *T. mentagrophytes* and *T. rubrum*.

Tinea barbae is an infection of the skin and hairs in the beard and mustache area. It is more common in men. The lesions may include erythema, scaling and follicular pustules. Zoophilic or anthropophilic dermatophytes are often implicated in tinea barbae infections. Most common agents include: *T. verrucosum*, *M. canis*, *T. megninii*, *T. mentagrophytes*, *T. rubrum* and *T. violaceum*.

Tinea pedis is usually referred to as Athlete's foot. It is an infection of the foot, characterized by fissures, scales and maceration in the toe web, or scaling of the soles and lateral surfaces of the feet. It is more common in those who wear occlusive shoes (Macura, 1993). In majority of cases, vesicles, erythema, pustules and bullae may also be present. Anthropophilic dermatophytes are the major cause of tinea pedis. Most common agents are *T. rubrum*, *T. mentagrophytes* var *interdigitale*, *E. floccosum*, *M. persicolor*, *T. raubitschekii* and *T. violaceum*. It has been estimated that tinea pedis is so common that one in five adults is affected (Male, 1990). The incidence also increases with age from adolescence (Male, 1990). During the past 3 decades, the incidence of tinea pedis has increased worldwide with an estimated prevalence of 10% in the developed world (Nelson *et al.*, 2003) and expectedly higher rate in most developing countries.

Tinea cruris, an infection of the groin, is an itchy, red rash in the groin and surrounding area which is commonly seen in young men living in a warm climate (Macura, 1993). Tinea pedis can co-exist if the infection is spread by scratching the feet and then the groin. Axillary infection can be seen as an analogous tinea pattern in women. Tinea cruris is predominantly caused by anthropophilic dermatophytes. Burning and pruritus are common symptoms. Pustules and vesicles at the active edge of the infected area, along with maceration, are

found in a background of red, scaling lesions with raised borders. *E. floccosum* and *T. rubrum* are the most common cause of tinea cruris. Other species include *M. nanum*, *T. mentagrophytes* and *T. raubitschekii*.

Tinea unguium, a dermatophyte infection of the nail, is usually characterized by thickened, broken and discolored nails. It is often referred to as onychomycoses and may result in the separation of the nail plate from the nail bed. Both anthropophilic and zoophilic dermatophytes can cause tinea unguium. *T. rubrum* and *T. mentagrophytes* var *mentagrophytes* are the most common agents. Others are *E. floccosum*, *T. tonsurans*, *T. violaceum*, *T. interdigitale*, *M. gypseum*, *T. soudanense* (considered by some mycologists to be an African variant of *T. rubrum* rather than a distinct full-fledged species) and the cattle ringworm fungus, *T. verrucosum* (Macura, 1993). Furthermore, *T. interdigitale* is still sometimes referred to as *T. mentagrophytes* var. *interdigitale*. The latter ought to be used to describe the zoophilic form of the dermatophyte and *T. interdigitale* used to describe its anthropophilic form. Recent molecular studies have shown that *T. mentagrophytes* var. *granulosum* is the same as *T. interdigitale* (Nenoff *et al.*, 2007).

Tinea manuum is a dermatophyte infection of one or, occasionally, both hands. It is most often caused by anthropophilic dermatophytes although zoophilic dermatophytes have also been reportedly recovered from tinea manuum infections (Weitzmann and Summerbell, 1995). In this form, the palms become diffusely dry, scaly and erythematous. Most common agents are *T. rubrum*, *E. floccosum*, *M. canis*, *M. gypseum*, *T. mentagrophytes* and *T. verrucosum*.

Tinea favosa is a severe and chronic infection which is caused by *Trichophyton schoenleinii*. It is characterized by scutula-the presence of yellowish, cup-shaped crusts on the scalp and glabrous skin. It is composed of epithelial debris and dense masses of mycelium. The disease is often common in Africa and the Eurasia (Weitzmann and Summerbell, 1995).

EPIDEMIOLOGY OF DERMATOPHYTOSIS IN WESTERN AFRICA

In Nigeria, there are varying reports of dermatophytosis in different cities and communities (Nweze and Okafor, 2005). Considering its human and socioeconomic diversity and the staggering population, this is understandable. This author carried out an extensive survey of dermatophytosis in Nigeria's Northeastern state of Borno. The study involved 2193 children aged between 4-16 years in different local

and urban communities of the state. Seven percent were proved to be positive for dermatophytosis. Incidence was significantly higher in young children aged 7-11 years and 4-6 years than in older children aged 12-16 years. Moreover, there was a significant difference in the incidence of dermatophytoses amongst children in urban and rural areas, thereby emphasizing the role of locality in dermatophytoses.

Tinea capitis was the predominant clinical type followed by tinea corporis. *Trichophyton schoenleinii* was the most prevalent etiological agent (28.1%), followed by *T. verrucosum* (20.2%) and *M. gallinae* (18.4%). Other species recovered included *T. mentagrophytes* (16.7%), *T. tonsurans* (10.5%), *T. yaoundei* (4.4%) and *M. gypseum* (1.8%) (Nweze, 2001). In a similar study carried out in Kano State Nigeria, 2150 itinerant quranic scholars were screened. Only 9.5% were found to be infected and the age group 10-14 years was most affected. *T. rubrum* (50.2%) was the most prevalent followed by *M. audouinii* (26.5%). *T. rubrum* was the only dermatophyte that was recovered from all sites apart from the buttocks (Adeleke *et al.*, 2008).

Out of a total of 6987 primary school children sampled across 4 schools in Jos, Plateau state Nigeria, only 3.4% were found to be infected by this disease. There was a high incidence of both scalp and foot ringworms among the infected children. A large spectrum of fourteen species of dermatophytes was isolated from the ringworm cases. The scalp ringworm had the highest number of fungal isolates. *Trichophyton mentagrophyte* and *T. rubrum* had the highest frequencies of occurrence (Ogbonna *et al.*, 1985).

Ten years later, Ayanbimpe *et al.* (1994) found that *Trichophyton soudanense* was the major aetiological agent in the same area, indicating a shift in the pathological spectrum of the species. In a recent and more expanded study involving several states in Central Nigeria, a total of 28505 primary school children aged between 3 and 16 years were sampled from 12 primary schools. Tinea capitis was found to be the most prevalent superficial mycoses. The most common aetiological agent was *T. soudanense*, (30.6%), followed by *M. ferrugineum*, (7.7%) and *M. audouinii*, (7.7%) (Ayanbimpe *et al.*, 2008).

In Ogun state, South Western Nigeria, a total of 2772 randomly selected junior secondary school pupils between the ages of 8-14 years from 60 schools were examined. The prevalence of dermatophytosis was 23.21%. Etiological agents identified with infection were *M. canis* (30.19%), *M. audouinii* (32.92%), *T. interdigitale* (14.37%), *T. soudanense* (9.73%) and *T. tonsurans* (12.05%). Most of the dermatophytes encountered were anthropophilic species. *M. canis* was the only zoophilic dermatophyte (Popoola *et al.*, 2006).

In a much older study in Lagos Southwest Nigeria (Adetosoye, 1977), 3860 school children were screened. The prevalence at the time was just 2.1%. Seven species of dermatophytes were recovered from specimens collected from the hair, skin and scalp scrapings of 81 school children. *T. soudanense* was the most etiological agent followed by *M. canis*.

Years later, another study in Lagos involving patients attending the Lagos State University Teaching Hospital, Lagos found that 162 (41%) of the patients were infected by dermatophytoses. *Microsporium* species were the most common species (74.1%), followed by *E. floccosum* (4.3%). Superficial mycosis of the skin was the most prevalent (59.3%), followed by that of the hairs (27.2%) while infection of the nails (13.6%) was the least. Those aged five years and below had the lowest isolation rate (3.7%) (Nwobu and Odugbemi, 1990).

In Mid-western state of Edo state Nigeria, another group found a prevalence of 13.4% among primary school children infected with dermatophytosis (Enweami *et al.*, 1996).

In one of the earlier studies carried out between 1974-1977 in the old Anambra state of Nigeria, (now subdivided into two States: Enugu and the new Anambra states), 3478 primary school children aged 4-13 years made up of 1868 males and 1610 females were screened for dermatophytoses. A total of 303 (8.7%) mycologically proven cases of tinea capitis were detected. *Microsporium audouinii* was the commonest etiological agent (48.3%) followed next by *T. soudanense* (26.6%) and *T. tonsurans* (15.2%). Other dermatophytes occasionally represented were *M. ferrugineum* (3.4%), *T. violaceum* (3.7%), *T. yaoundei* (1.2%), *T. mentagrophytes* (0.9%) and *T. schoenleinii* (0.6%). Investigation of scalp carriage of dermatophytes by the authors showed that approximately 9% of children without any clinical signs of tinea capitis harbor dermatophytes in their scalp hair (Gugnani and Njoku-Obi, 1986).

More recently, further studies involving this author were conducted in the new Anambra State by screening 1624 children with clinically suggestive lesions. These children aged between 4 and 16 years were sampled in selected urban and rural areas of the State. Our data showed that tinea capitis was the predominant clinical type. *T. tonsurans* was the most prevalent etiological agent while *M. audouinii* was the least in occurrence (Nweze and Okafor, 2005). Emele and Oyeka (2008) in another larger study which involved a total of 47723 primary school children residing in different regions of Anambra State, found that 4498 (9.4%) had tinea capitis. The highest prevalence of the disease occurred in the Southern region of the state (12.6%). Schools in urban

areas recorded lower prevalence of the disease. Moreso, tinea capitis occurred significantly more in children below 10 years of age than in those above this age. This agrees in part with the findings in Anambra state by Nweze and Okafor (2005). *M. audouinii* was the most prevalent (42%), followed by *M. ferrugineum* (17%) and *T. mentagrophytes* (16%).

In Aba, Abia State in Southeast Nigeria, *T. mentagrophytes* was however observed to be predominant in primary school children (Okafor and Agbugbaeruleke, 1998). In a neighbouring local community of Arochukwu, also in Abia state Nigeria, it was found that tinea capitis was the predominant clinical type of dermatophytoses affecting 13.7% of the total population studied. *T. soudanense* and *T. tonsurans* were the predominant etiological agents of dermatophytoses with a prevalence of 26.2 and 21.6%, respectively (Ngwogu and Otokunefor, 2007).

In Togo, a study involving 374 children from primary schools in North and Southern part of the country revealed that 11% of the children in the North (dry and urban area) and 20% in the South (wet and rural area) had obvious clinical lesions. Two species of dermatophytes were isolated: *Microsporum langeronii* and *T. soudanense*; this second dermatophyte being uncommon in the South. Moreover, 15% of the children in the North and 42% of the children in the South were asymptomatic carriers (Dupouy-Camet *et al.*, 1988). This suggests that the locality predispose to dermatophytoses and concurs with the findings in Nigeria (Nweze, 2001; Nweze and Okafor, 2005). In another study in Germany involving children arriving from Togo including an 8 week-old male baby, *T. soudanense* was recovered from discrete lesions on the hairy scalp and neck of these patients, thus confirming that this agent was indeed common in Togo (Faulhaber and Korting, 1999). A ten year retrospective study had indicated that dermatosis was a significant public health problem in Togo (Napo-Koura *et al.*, 1997)

In Dakar, Senegal, Gaye *et al.* (1994) found that the poor school and home background along with other socioeconomic factors were responsible for the high prevalence of tinea capitis. In another study conducted in the Mycology laboratory of Hospital A. Le Dantec, Dakar, Senegal,, 1512 patients aged from 14 days to 70 years with a mean age of 21.4 years including 882 with suspected tinea were screened and a prevalence of 25.7% was established. The main etiological agents were *T. soudanense* (47.3%), followed by *T. rubrum* (33.41%) and *Microsporum langeronii* (11.3%). Only a single case of *T. violaceum* was isolated. These species were earlier shown to be the predominating agents of

dermatophytosis in Senegal. The prevalence of dermatophytosis seems to vary across various regions of Senegal. Develoux *et al* (2002) found a frequency of 26.4% in Dakar, whereas Silverberg *et al.*, (2002) and Cremer *et al.* (1997) reported 11.4 and 11%, respectively. In a recent two year study involving three dermatology Centers in Senegal, 16% of HIV patients with dermatosis had dermatophytic infections suggesting that dermatophytoses could pose a future problem in this country with the increasing incidence of HIV/AIDS among the inhabitants of this country (Monsel *et al.*, 2008).

In the Northern flanks of West African countries of Guinea Conakry and Burkina Faso *T. violaceum*, *T. rubrum* and *T. soudanense* were the predominating etiological agents of dermatophytoses (Menan *et al.*, 2002; Guiguemde *et al.*, 1992). The report from Guinea Conakry indicated a shifting trend as it was noted earlier in 1959 that *T. soudanense* and *M. audouinii* were more prevalent in that country. The two agents were often seen in tinea capitis while the former was responsible for tinea corporis cases (Philpot, 1978).

A study conducted at the Dermatology Center of Treichville Hospital in Abidjan, Cote d'Ivoire found a three fold higher incidence of tinea capitis in boys than in girls and a peak during childhood especially those aged between 5 and 9 years. The most frequent etiologic agents were *T. soudanense* and *M. audouinii* var *langeronii* in 63.6 and 31.3% of cases respectively (Adou-Bryn *et al.*, 2004). This finding is in agreement with earlier reports in that country (Deblock *et al.*, 1959).

In Ghana, studies conducted among 463 in the Greater Accra region showed that *T. violaceum* (26%) was the most prominent species in Ghana, followed by *T. tonsurans* (22%). The percentage occurrence of *M. audouinii* (15%) was relatively low compared to other studies performed in Africa. The prevalence of *T. rubrum* was 11% and no *T. soudanense* was recovered in the study (Hogewoning *et al.*, 2006). Tietz *et al.* (2002) recovered a rare species of the *T. rubrum* complex (*Trichophyton raubitschekii*) in Germany from a set of four African immigrant patients who presented with typical lesions of tinea corporis. One of the patients was from Ghana and the other three were from Cameroon. In a similar incident in the USA, two African children internationally adopted from Liberia in West Africa, who were residing in Cincinnati, Ohio, presented with tinea capitis associated with *T. soudanense*, a dermatophyte that is not common in the whole of North America (Markey *et al.*, 2003).

It was previously reported that tinea capitis is the most clinical form of dermatophytosis in both Liberia and

the Republic of Chad where *T. soudanense* was the main etiological agent (Philpot, 1978). This finding in Germany confirmed earlier observations that *T. rubrum* is a major etiological agent of dermatophytosis in Cameroon, making up about 81.8%, followed by *T. soudanense* (12.1%) and *T. interdigitale* (6.1%). (Lohoue-Petmy *et al.*, 2004). Tinea corporis constituted up to 10.5% of cases followed by tinea pedis (8.9%).

In Mali, out of a total of 517 isolations of dermatophytes collected, *Trichophyton* species were more common than *Microsporum* species. *T. verrucosum* and *M. canis* were reported in Mali for the first time in this study. *T. schonleinii* and *T. soudanense* were also found to be prevalent in the sub-saharian areas of the country (Mahe *et al.*, 1997). Tinea capitis was also reported to be the second most common cause of skin infections in Mali being responsible for about 9.5% of all skin diseases (Mahe *et al.*, 1995).

In summary, it may be concluded that the most common etiological agents of dermatophytoses in the West African sub-region are *T. soudanense* and *M. audouinii*, with *T. rubrum*, *T. mentagrophytes*, *T. tonsurans* and *T. violaceum* recently playing dominant role in some locations in the region. Although, dermatophytes respond well to conventional antifungal agents (Weitzmann and Summerbell, 1995; Nweze *et al.*, 2007), many patients usually cannot afford the cost of conventional antifungal antibiotics but use local medicinal plants to treat the infections. Our laboratory tested some of these plant extracts which are in use in Nigeria against dermatophytes recovered from patients and indeed found that some of them have good *in vitro* activities against dermatophytes (Okafor *et al.*, 2001; Nweze *et al.*, 2004). This may have helped a great deal in reducing these dermatophytic infections in western African countries such as Nigeria.

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