

## THE PREVALENCE OF DERMATOPHYTES AMONG ALMAJIRI (DISCIPLES) IN BAUCHI STATE

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**ABSTRACT:** The prevalence of Ringworm Infection among the Almajiri (Disciple) children in Shira LGA, Bauchi State. This work was carried out in June – July, 2011. A total of 120 samples were collected and cultured for bacterial isolates. Out of the 120 samples collected 61 (51%) were positive to dermatophysis and 59 (49%) were negative to it. Skin scrapings were collected and examined microscopically, cultured onto Sabouraud dextrose agar and incubated at room temperature. The resultant colonies were identified. *M. auduinii* had the highest incidence with 38 (62.3%), *M. canis* 22 (36%) and *M. distortum* 1 (1.6%).

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### INTRODUCTION

Fungi are a member of a large group of eukaryotic organisms that includes microorganisms such as yeasts and molds as well as the mushrooms. These organisms are classified as a kingdom, Fungi, which are separate from plants, animals, and bacteria. One major difference is that fungal cells have cell walls that contain chitin, unlike the cell walls of plants, which contain cellulose (Hibbett *et al*, 2007). These and other differences show that the fungi form a single group of related organisms, named the *Eumycota* (*true fungi* or *Eumycetes*), that share a common ancestor (a *monophyletic group*) (Hibbett *et al*, 2007). This fungal group is distinct from the structurally similar Myxomycetes (slime molds) and Oomycetes (water molds). Many fungi are parasites on plants, animals (including humans), and other fungi are serious pathogens of many animals including humans, such fungi are the Dermatophyte that cause infection on the skin, nail and hair of man (Rodgers *et al*, 2001). Dermatophyte causes infections of the skin, hair and nails due to their ability to obtain nutrients from keratinized material (Zuber *et al*, 2001). The organisms colonize the keratin tissues and inflammation is caused by host response to metabolic by-products. They are usually restricted to the nonliving confide layer of the epidermis because of their inability to penetrate viable tissue of an immunocompetent host (Rodgers *et al*, 2001). Invasion does elicit a host response ranging from mild to severe. Acid proteinases, elastase, keratinases, and other proteinases reportedly act as virulence factors. The development of cell-mediated immunity correlated with delayed hypersensitivity and an inflammatory response is associated with clinical cure, whereas the lack of or a defective cell-mediated immunity predisposes the

host to chronic or recurrent dermatophyte infection. Occasionally the organisms invade the subcutaneous tissue resulting in kerion development (Adams BB, 2001).

### GENERAL CHARACTERISTICS OF DERMATOPHYTES

Kobayashi (1990) numbers of each of the genera, making up the dermatophytes, have specific tissues they infect. The reason for the specificity is not clear, although it is suspected to be based on nutritional requirement whereas most *Trichophyton* species can attack all the epidermal keratinized tissue (Skin, Hair and Nails) while *Microsporum* species only degrade hair and skin.

The three (3) genera of dermatophytes produce two types of asexual spores (aleuriopores); the small, unicellular microconidia and the large macroconidia produce large number where present, in both *Microsporum* and *Trichophyton* species (Kobayashi, 1990).

Some other hyphal structures that assist in identification exist amongst the dermatophytes features such as Racquet hyphae, Chlamydospores and Pectinate hyphae are commonly seen while spiral hyphae and microconidia “engrape” are peculiar to *T. mentagrophytes* and antler like hyphae are for *T. schoenleinii* (Kobayashi, 1990).

### CLINICAL PRESENTATION MANIFESTATION

The feature of the skin lesion varies depending on the causative agent and the site affected for example, infections of the feet tend to be chronic and can be scaling vesicular or ulcerative form. Such infections may result in hyperkeratosis of the plantar surface of the feet (Adams BB, 2001). Scaling can

occur with or without erythema and may be restricted to the lateral aspect on the sole, the instep or the inner digital area (Adams B.B, 2001). Tinea corporis typically presents a well-defined erythematous, scaling plaque on the arms, legs and trunk, and lesions often assume a circular “ringworm” shape. However, the distribution of Tinea corporis gladiatorum is different affecting the head, neck and upper extremities but rarely the legs (Adams B.B, 2001).

Scalp infections may result in kerion formation characterized by a raised tender mass of inflamed tissue.

In contrast, the anthropophilic species which typically colonized humans (e.g. *T. rubrum*, *T. mentagrophyte*, *Var. interdigitale* and *T. tonsurans*) tend to be associated with more chronic infections which are less inflammatory in nature (Adams BB, 2001).

Dermatophytic fungi appear to occupy a niche which is optimal to their survival and growth in the host-pathogen relationship (Adams BB, 2001).

Interestingly, infections of the scalp (Tinea capitis) are also caused primarily by *T. tonsurans* and it is thought that asymptomatic scalp infections may be a reservoir for transmission (Adams, BB, 2002).

Elewski, B. E (1993), dermatophytes organisms associated with Onychomycosis invade the nail plate as well as the surface of the nail itself, most frequently resulting in yellow-brown discoloration ridging and thickening (hyperkeratosis).

*Microsporum* has the ability to degrade keratin and this can reside on the skin and its appendages and remains non-invasive. As well as the keratinase enzyme, proteinase and elastases of the fungus may act as virulence factors. Notably, *Microsporum spp* mostly infect the hair and skin except for *Microsporum versicolor* which does not infect hair, nail infection are very rare.

The pathogenesis of the infection depends on the natural reservoir of the species. Geophilic spp are acquired via contact with soil, zoophilic spp are transmitted from the infected animal direct or indirect via formites, human-human transmission is of concern for anthropophilic spp. Asymptomatic carriage may be observed as well as the otherwise healthy hosts. Immunocompromised patients are affected (Summerbel, 1997).

Despite the availability of new systemic anti fungal therapies, nail infections are difficult to eradicate with recurrence reported in up to 25 to 40% of the cases (Hay, 2001).

Dermatophytes account for the majority 90% of cases of fungal nail infections (Chomycosis). In the United States and Europe (Ellis *et al*, 1997), the overall prevalence of fungal nail infection reported as

part of the US health and nutrition examination survey (NHANES 1), during the 1970's was relatively low (2.18%) (Anonymous, 1979).

Elewski and Charif (1993) by contrast a more recent cross-sectional survey confirmed the presence of dermatophytes on Chomycosis is 8.7% of the patients attending a dermatology clinic in Cleaveland, Ohio. Furthermore a recent multi center Epidemiological survey carried out in North America reported Onychomycosis in 13.8% of participants (Ghannoun *et al*, 2000) in that study participants were the patients attending primary-care, physician offices or persons accompanying them during their visits. Thus, the relative high prevalence of Onychomycosis in these two studies may reflect selection of the study population. Previous studies carried out in Europe reported as incidence of the Chomycosis ranging from 2.7 to 8.4% (Gupta *et al*, 1992; Heikkila and Stubb, 1995; Robberts, 1992; Saia and Peytri, 1995). Results reported in 2003 were showed that 34.9% of the 70,497 patients enrolled in study 1 had foot disease of fungal origin with Onychomycosis and Tinea pedis (athletes foot) being the most common. Thus, the incidence of fungal foot disease was strikingly high. There is no doubt that the different enrollment and diagnosis criteria for these studies could contribute to the variability in reported prevalence of Onychomycosis, for example questionnaire based on studies which are dependent on self-diagnosis which have been reported a relatively low prevalence of Onychomycosis (<3%) (Roberts, 1992; Sais and Peyri, 1995).

Regardless, Epidemiologic studies point to an increase in the incidence of dermatophytes since 1970's. Reasons for this increase are not clear, although it may be due to an aging population in North America, indeed an increase in infection with increasing age is well established (Elewski and Charrif, 1997) this observation is consistent with the view that changes in the immune response which occur with advancing age lead to disease susceptibility in keeping with this, fungal nail infections are more frequent in Immunocompromised patients such as those who are human immunodeficiency virus (HIV) positive and those who have a case of diabetes (Feargemann J and Baran, 2003; Ghannoun *et al*, 2000; Gupta *et al*, 1992).

Alternatively, age-related changes in peripheral vasculature may be important in predisposing to infection (Faergemann and Baran, 2003).

Other factors which have been implicated include those associated with “modern lifestyle” including the use of foot wear made from synthetic materials and exposure to dermatophytes in

communal areas with damp environments which favor fungal growth, such as swimming pools and school gymnasiums.

Despite the identification of multiple predisposing factors though is not consensus of the opinion regarding a single mechanism to explain the increased incidence of food disease which has occurred in recent years (Field survey).

In countries with warm climate and other geographical regions, different dermatophyte species may be involved however *T. rubrum* remains one of the most frequent clinical isolates, for example in Libya, yeast of the genus *Candida* are the dominant cause of Onchomycosis in women, with *T. violaceum*, *T. rubrum*, *T. mentagrophyte* and *T. microsporum canis* being responsible for the majority of infection in men (Ellabin *et al*, 2002). Similar observations have also been reported from Pakistan (Bukhari *et al*, 1999).

## MATERIAL AND METHOD

### SPECIMEN:

Specimens were obtained from the Almajiri (Disciple) children at their various schools. This was done following as earlier, through physical examination and assessment of identified cases.

A control specimen was obtained from apparently health Almajiri children and those children attending regular schools that are non Almajiri children.

A total number of Eleven (11) schools were visited out of which samples were obtained from affected part of the body.

### METHOD OF COLLECTION AND HANDLING OF SPECIMEN

Approaches to specimen collection varies, depending on the nature of infection and site of the body affected (Devise 1995).

Several methods have been describe by mycologists e.g. methods described by Sneddon and Church (1976). Use of microscope slide or vinyl adhesive tape described by Miln (1974), others include use of sterile scapel or sterile epilation forcepts (Gerd and Howard, 1975).

Cheesbrough 1993 described and recommended the use of sterile surgical blade or scapel. This method was employed in this research.

### METHODOLOGY

The affected area was cleaned with 70% v/v ethanol. This was followed by scrapping the surface of the margin of the lesion using a sterile surgical blade.

Hair specimens were collected by removing dull broken hair from the margin of the lesion using

sterile surgical blade. Specimens were folded in the dark colored paper to form a flat packet and closed with a paper clip, they were correctly labeled with the name, number, source of material and the data collected.

The specimens were taken to the Lamingo, Jos University Teaching Hospital (JUTH) for investigation.

## METHODS OF INVESTIGATION

Reviews were made of various research works and surveys on Ringworm infection including occurrence and distribution.

Questionnaire was designed and used to ascertain predisposing factors e.g. nutritional factors, social and environmental factors of the affected Almajiri and unaffected Almajiri children as well.

Laboratory diagnosis to ascertain and identify the infecting specie was done.

## LABORATORY INVESTIGATION

The method described by Devise (1995) and Cheesbrough (1993) for macroscopy and cultural methods were adopted for this work. They are methods routinely used in laboratories

### DIRECT MICROSCOPY

A drop of KOH (20% w/v) was placed on a microscopic slide, small piece of the specimen were transferred on to the drop of KOH covered with a coverslip.

The preparation was placed in a Petri dish containing a damp piece of cotton wool to prevent the preparation from drying out. It was left for 10 minutes (Hair sample) and 20 minutes (for Skin scales and Crusts). The preparations (Specimens) were examined using x10 and x40 objectives with the condenser and iris diaphragm sufficiently closed to give a good contrast.

Branching hyphae, chain of angular or rounded arthrospores or both were looked for and noted whether the infection was on the surface of hair (ectothrix) or inside of it (endothrix) (Cheesbrough, 1993).

## CULTURE METHOD

Sabouroud dextrose agar was used and prepared using the method described by Devise (1995). The media were inoculated with the specimen and incubated at room temperature for up to three (3) weeks, examined 2 days intervals for sign of fungal growth.

### MACROSCOPIC EXAMINATION OF CULTURES

The texture and surface color of the colonies were carefully noted. The colors of the reverse (underside) of the colonies were recorded along with any pigment that diffused into the medium.

### MICROSCOPIC EXAMINATION OF GROWTH

There are several methods for microscopically examining a fungus culture (Devise, 1995). These are:-

- I. Tease mount
- II. Cellophane tape mount
- III. Slide culture

The tease mount method was employed. A drop of lactophenol cotton blue (LPCB) was placed on a clean grease free glass slide with a bend dissecting needle, a small portion of the colony was

removed from the agar surface and place in a drop of lactophenol cotton blue (LPCB).

The colony was gently teased and covered with a cover slip without attracting air bubbles and observed under microscope with lower objective.

### RESULT

A total of 120 samples were collected and processed from Almajiri children (Disciple) of ages from 5 – 17 years. Out of this number 61 were found positive with dermatophyte species.

The dermatophyte species isolated comprised the different species of *Microsporum* which included *M. audouinii*, *M. canis* and *M. distortum* mean while the specie of *Candida* and *Aspergillus* were also isolated as a contaminant.

Among the *Microsporum* isolated, the *M. audouinii* has high rate of 62.3% followed by *M. canis* with 36.1%. *M. distortum* has the lowest percentage occurrence of 1.6% (Table II).

**TABLE I. DISTRIBUTION OF DERMATOPHYTE SPECIE AMONG AGE GROUPS**

DERMATOPHYTE	AGE GROUP
<i>M. audouinii</i>	1 – 17
<i>M. canis</i>	1 – 10
<i>M. distortum</i>	5 – 12

**TABLE II. PERCENTAGE OCCURRENCE OF DERMATOPHYTE SPECIE**

Specie	No Isolated	Percentage (%)
<i>M. audouinii</i>	38	62.3
<i>M. canis</i>	22	36.1
<i>M. distortum</i>	1	1.6
<b>TOTAL</b>	61	100

**TABLE III. PERCENTAGE DISTRIBUTION OF DERMATOPHYTE AMONG THE AGE GROUPS**

AGE	NUMBER OF POSITIVE	PERCENTAGE
1 -5	10	16.4
6 – 10	34	55.7
11 – 15	14	23.0
16 – 20	3	14.9
<b>TOTAL</b>	61	100%

## DISCUSSION AND RESULT

Based on the response obtained from the questionnaire it was easy to consider prevalence of the ringworm infection among the Almajiri children (Disciple) to the following factors:

- I. Personal hygiene
- II. Nutritional status
- III. Environmental condition

It was noted from field survey that there was a poor personal hygiene in which some of the respondents bath on a weekly basis 51% of the children do not use soap when bathing and 49% use ordinary soaps like toilet soaps and laundry soaps. And their cloths were hardly washed at frequent intervals.

This therefore is an important point source of an infection especially the specie of *M. audouinii* among all age groups in this work. It was stated by BB in 2002 on indirect contact of infection.

*M. audouinii* had the highest occurrence of 62.3% and this shows the findings and reports of Hay in 2001 and Cheesbrough in 1993 that it occurs worldwide.

Adams BB, 2001 in his work said that *M. distortum* primarily causes hair and skin infection, it has an occurrence of 1.6%. Again Brilliant et al, 2000 in their finding, reported that dermatophytosis in children usually manifests as infection of the scalp caused by *M. canis* and incidentally, this specie was isolated in this work and having an occurrence of 36.1%.

Nutrition plays a vital role in the body's immune system to fight against infection. These children lacking balance diet (Carbohydrate food, Proteins, Vitamins, Mineral and Salt) in their meals consumed, this is because their meals obtained through begging or house boy and restaurant workers.

More so, there is no proper arrangement for feeding and money given by their parents finished, lack of parental visitation, some of the children use to visit home yearly or two years. Another way of spreading infection is sleeping arrangement in close proximity to one another, thus leading to a probability of coming in contact with infection during sleeping.

There is a considerable body of evidence to support the link between personal hygiene, poor nutrition and Environmental conditions to the spread and persistence of dermatophytosis. Furthermore, *M. audouinii* is the most prevalent of the dermatophyte infection having an occurrence of 62.3% affected all the groups worked on. The ages 1 – 10 and 5 – 12 affected by the species of *M. canis* and *M. distortum* respectively.

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