

Incidence of Dermatophytic Infections among the Inhabitants of Ondo North Senatorial District, Ondo State, Nigeria

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Abstract

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This study helps to investigate the epidemiological status of dermatophytosis among the inhabitants of Ondo North district, Ondo State, Nigeria and to identify organisms associated with the infection. Skin, nail and swabs/scrapings were collected from individuals suspected to have the symptoms of dematophytosis after seeking ethical clearance from the appropriate authority. Five hundred and twenty individuals (339 males and 181 females) were considered for the study and samples were analyzed using standard microbiological methods. Three hundred and sixty-six out of the total sample analyzed tested positive. The dermatophytes isolated include: Trichophyton ajelloi, T. mentagrophytes, T. rubrum, T. schoelenii, T. soudanenses, T. tonsurans, T. verrucosum, Microsporiumaudonii, M. canis, M. gypseum, and Epidermophyton floccosum. The highest occurrence of 248 (47.7%) was recorded within the age group 1-10 years, while least occurrence of 10 (1.9%) was observed among individuals aged 40 years and above. Scalp infection was the most prevalent with 56% of the all infections, while the face and nail infections were the least with 1% of the infections. School pupils were found to contribute to majority of the cases (84%), followed by the farmers (8.6%) while the lowest infection was found among the community health workers. The participants having low socioeconomic status in their living environment were found to be predominant (70.77%) in the study while those with high socioeconomic status were of lowest percentage (10.58%). Dermatophytosis is a common public health problem affecting all age groups especially the school pupils and the less educated people in the study area, whereas the infected individuals rarely seek medical advice for their treatment. Unhygienic conditions among low socio-economic group, overcrowding and poor personal hygiene are some of the contributing risk factors.

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INTRODUCTION

Fungi are widely distributed in many habitats. Most are harmless saprobes, but approximately 300 species cause mycotic infections in human (Talaro, 2005). Fungal infections are categorized as superficial, cutaneous, subcutaneous and systemic. The superficial mycoses are infections limited to the outermost layer of the skin. An example is *Tinea versicolor* which affect areas supplied by the sebaceous glands, especially the shoulder, neck and trunk (Sandy, 2008). Cutaneous mycoses are those that extend deeper into the epidermis, hair and nail. These diseases are restricted to the keratinized layers of

the skin, hair, and nails. The organisms that cause these diseases are called dermatophytes (Khaksari *et al.*, 2009).

Dermatophyte is a common fungal disease in human commonly referred to as “ring worm” or simply “tinea”. It is a contagious fungal infection of the stratum corneum of the skin, hair and nail (Ali *et al.*, 2009). The dermatophytes have the capacity to invade keratinized tissue such as skin, hair and nails of human and animals to produce infection. The disease caused by dermatophytes is clinically known as dermatophytosis. A

general name for acute to mild and chronic lesions of the outer layers of keratinized tissues caused by dermatophytes (Vikesh and Prakash, 2014).

The prevalence of superficial mycotic infections has risen to such a level in the last decades that skin mycoses now affect more than 20–25% of the world’s population making them one of the most frequent forms of infections. Developing countries have high rates of *Tinea capitis*, while developed countries have high rates of *Tinea pedis* and *Onychomycosis* (Seebacher, *et al.*, 2008). Low socioeconomic conditions are strongly linked to higher prevalence rates for skin infections. A recent study found *Tinea capitis* present in more than 30% of children at certain grade levels in some urban areas of the United States (Abdel-Rahman *et al.*, 2010). The objectives of the research are to determine the prevalence or incidence of dermatophyte or superficial mycoses among the inhabitant of the study area and to isolate and characterize organisms associated with superficial skin infections from these sources.

MATERIALS AND METHODS

The ethical clearance was obtained from each Local Education Authorities, community rulers and public health centre coordinators within Ondo North senatorial district in Ondo State. Questionnaire was administered to individuals who agree with the concept of the study as well as pupils whom their parents gave consent to participate in the survey. The scrapings from the scalps,

skin and nails were collected randomly from individuals suspected to have the symptoms of dermatophytosis. The infected body parts were swabbed with sterile cotton wool moistened with 70% ethanol to remove any dirt and bacteria contaminants. Direct microscopic examination was carried out using 20% KOH on the samples collected for 10 minutes. Saboraud Dextrose Agar (SDA) containing Cyclohexamide (0.05%) and chloramphenicol (0.004%) under sterile conditions, and Dermasel Agar were prepared according to the manufacturer’s specification. The collected samples were inoculated and incubated at 28°C for four weeks; and examined daily for fungal growth at 2 to 3 days interval. Identification was done based on the growth characteristics and morphology of the fungi. Identification by microscopy using lactophenol cotton blue stain was performed (Hainer, 2003)

RESULT

The highest incidence of dermatophytosis was recorded in the age group of children from 1 to 10 years old of 248 (47.7%) they are followed by groups of 11-20 years of 174 (33.5%), 31-40 years 57(11.0%), 21-30 years 31 (6.0%), while least occurrence of 10 (1.9%) was observed in age range above 40 years Figure 1. The gender distribution of dermatophytes infections among the natives of eleven towns within study area in Ondo State shows the male population to be 339 while the female population was 181. This gives the ratio to be 2:1. Figure 2.

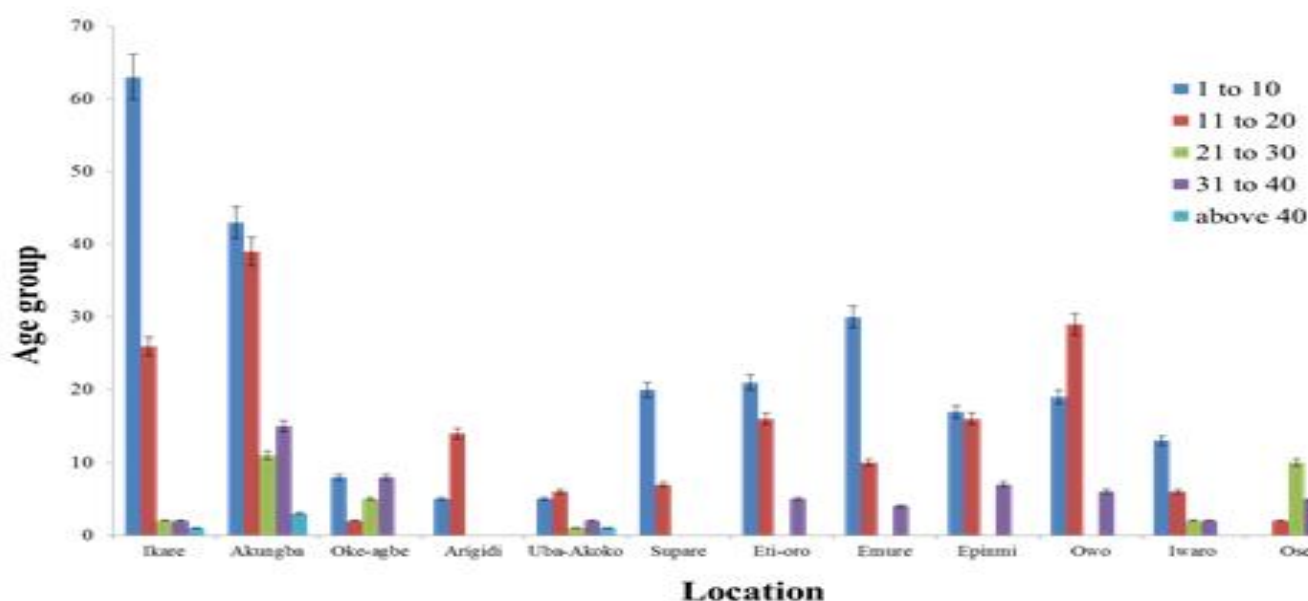


Figure 1: Distribution of age group of participants in the study area

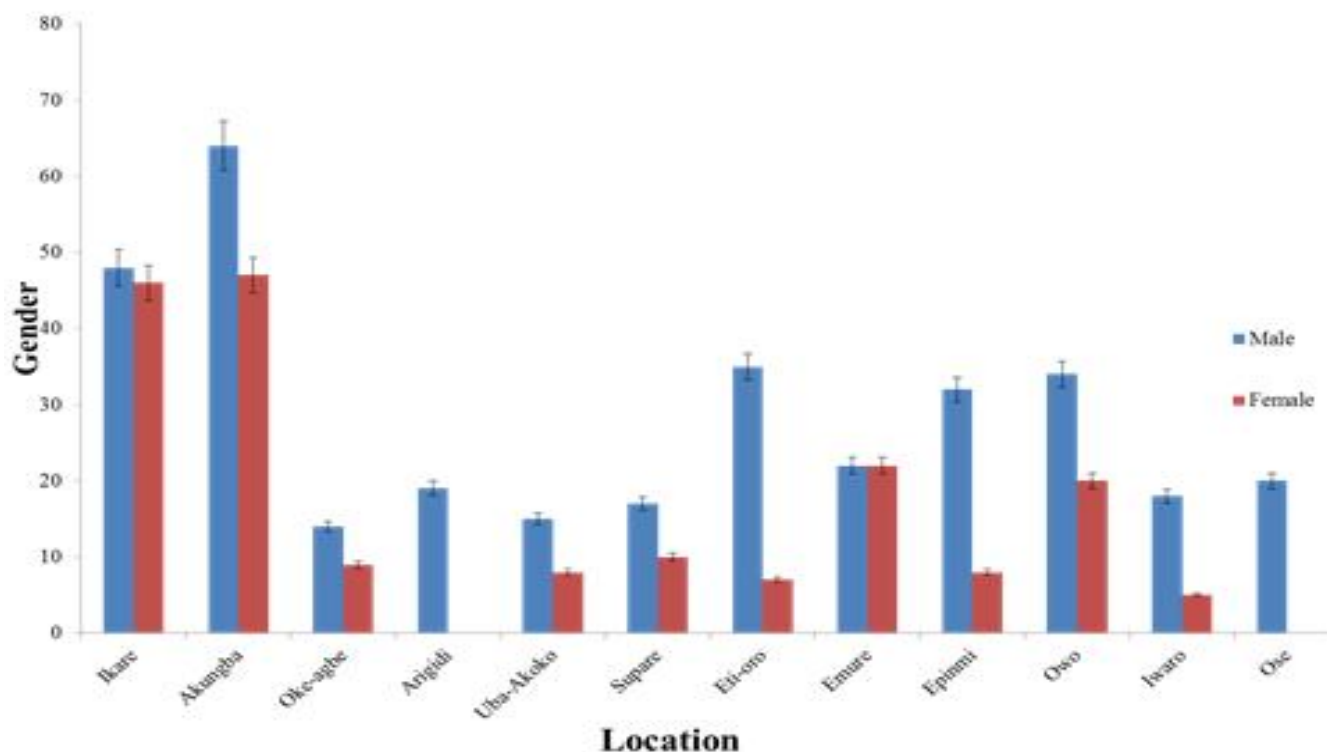


Figure 2: Distribution of gender of participants in the study area

Out of five hundred and twenty (520) samples examined, 366 samples were positive for both microscopy examination (KOH) and cultural examination while 10 samples were positive for culture and negative for KOH

test. Sixty-one samples were negative for KOH test and culture while 93 samples were positive for KOH and negative for the cultural examination (Table 1)

Table 1: The microscopic and cultural examination of the samples

Microscopy (KOH) /Culture	KOH Positive	KOH Negative	Total
Culture positive	356 (68.5%)	10 (1.9%)	366
Culture negative	93 (17.9%)	61 (11.7%)	154
Total	449	71	520

The dermatophytes isolated are *T. rubrum*, *T. mentagrophytes*, *T. soudanensis*, *T. ajelloi*, *T. tonsurans*, *T. verrucosum*, *T. schoelenii*, *M. canis*, *M. gypseum*, *M. audouinii*, and *E. floccosum*

Table 2. Morphology characteristic of the isolates

Isolates	Appearance	Reverse	Hyphae	Septa	Spore	Spread features	Probable organism
1	Tan to brown	Reddish brown	Branched	Septate	Large conidia	Hyphal growth, pectinate hyphae sometimes /present	<i>M. audouinii</i>
2	White to cinnamon brown	Yellow tan	Branched	Septate	No spores	Numerous macroconidia, sparse microconidia	<i>M. gypseum</i>
3	White to yellow or brown	Yellow to orange	Branched	Septate	No spores	Large macroconidia, most common in the centre of the colonies	<i>M. canis</i>
4	White to cream	Colourless to reddish brown	Branched	Septate	Large conidia	Abundant microconidia, some macroconidia and spiral hyphae	<i>T. mentagrophytes</i>
5	Yellow to apricot	Deep yellow	Branched	Septate	Short conidia	Few microconidia, reflexive branching at edge of colonies, arthrospores and chlamyospores may present	<i>T. soudanense</i>
6	White to sulphur Yellow	Cream to deep mahogany	Branched	Septate	Chlamyospores	Abundant microconidia, chlamyospores	<i>T. tonsurans</i>
7	White to Bright Yellow to cream	Colourless	Branched	Septate	Chlamyospores		<i>T. verrucosum</i>
8	White to light grey		Unbranched	Aseptate	No spores	Characteristic antler hyphae with swollen tips	<i>T. schoeleinii</i>
9.	Yellow brown to greenish brown	Colourless yellow brown	Branched	Septate	Chlamyospores	Chlamyospore are numerous in older culture	<i>E. floccosum</i>
10.	White to cream or pink	Wine to red	Branched	Septate	Chlamyospores	Hyphae are stunted and chlamyospore are common	<i>T. rubrum</i>
11	Orange to blue black		branched	septate	macroconidia	thick and absent	tan

Table 3 shows the type of infection in relation to the part of the body they were isolated. *T. mentagrophyte* and *T. rubrum* were the most frequently isolated dermatophytes, having occurrence of 139 (38%) and 83 (22%) respectively while *T. ajelloi* 5(1%), and *M. canis* 8(2%) had the least occurrence. In Figure 3, the

incidence of fungi infection at different body site of the patient is represented in a pie chart. Scalp infection was the most prevalent with 56% of the all infections, followed by the feet infection which is 24% while the face and nail infection were the least with 1% of the infections

Table 3: Prevalence of types of Tinea infection based on the site of infection and species isolated among participants

Microorganism	Scalp	Nail	Toe	Skin	Face	Total	%
<i>T. rubrum</i>	34	3	41	3	2	83	22
<i>T. ajelloi</i>	0	0	2	3	0	5	1
<i>T. mentagrophytes</i>	58	2	53	25	1	139	38
	15	1	4	5	0	25	7
<i>T. schlonenii</i>	3	0	0	3	0	6	2
<i>M. audounii</i>	12	0	0	0	0	12	3

Table 4: Prevalence of types of Tinea infection based on the site of infection and species isolated among participants

Microorganism	Scalp	Nail	Toe	Skin	Face	Total	%
<i>M. canis</i>	6	0	2	0	0	8	2
<i>M. gypseum</i>	23	4	17	0	0	44	12
<i>T. verrucosum</i>	12	0	3	3	0	18	5
<i>T. tonsurans</i>	7	0	1	1	0	9	3
<i>E. Floccusum</i>	1	2	14	0	0	17	5
	171(46%)	12(%)	143(39%)	41(11%)	3(1%)	366	100

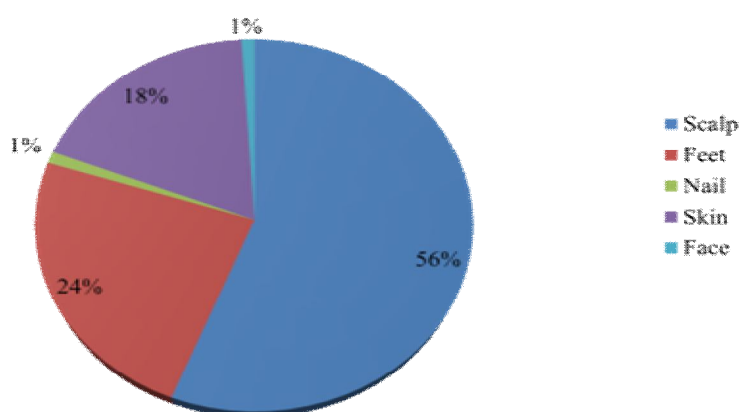


Figure 3: Pie chart representing the occurrence of fungi infection at different body site on the participants.

The occupational distribution of individuals participating in the survey at varying percentage in the study area. Table 5. The pupils were found to contribute to majority of the cases (84%), followed by the farmers (8.6%) while the least category were the health workers.

The distribution of socioeconomic status within the participants in the study area was indicated in Table 6. Most of individual tested within the study area have very low socioeconomic status (70.77%) compared to individual having high socioeconomic status (10.58%)

TABLE 5: The occupational distribution of individuals participating in the survey.

OCCUPATION	NUMBER OF INDIVIDUALS	PERCENTAGE (%)
STUDENTS	439	84.0
FARMERS	45	8.6
CIVIL SERVANTS	19	3.7
TRADERS	14	2.7
MANUAL LABOURERS	4	0.8
HEALTH WORKERS	2	0.2
TOTAL	520	100

TABLE6: Distribution of socioeconomic status within the participants in the study area

Low socio-economic status	Middle socio-economic status	High socio-economic status	Total
Number of cases	Number of cases	Number of cases	
368 (70.77%)	97 (18.65%)	55 (10.58%)	520

DISCUSSION

The sex distribution of the infected individuals indicates that male infected population is 65.2%

While the female infected population is 36.2%. This higher prevalence among males is seen across all the towns sampled. This is similar to the findings of Ali-Shtayah *et al* in 2015 who reported higher percentage in male infection but contrary to that reported by Anosike *et al* in 2006 and Omar in 2000. The higher susceptibility of boys could be due to their frequent contact with soil as a result of farm work and football. The majority of the organisms isolated belong to the genera *Trichophyton* and *Microsporum*. *T. mentagrophyte* and *T. rubrum* have the highest occurrence of 139 (38%) and 83 (22%) respectively out of the 366 isolates. This is similar to studies conducted by Peerpur *et al.* (2004) and Doddamani *et al* (2013).

Other dermatophytes isolated were *M. gypseum* (12%), *T. soudanense* (7%), *E. floccosum* (5%), *T. tonsurans* (3%), *T. verucosum* (5%), *T. scholonenii* (2%), *M. audonii* (3%), *T. ajelli* (1%), and *M. canis* (2%). Among all the diagnosed cases, 248 (49.6%) fall in ages 1-10, 174 (33.5%) are ages 11-20, 31 (6.0%) in ages 21-30, while ages 31-40 and ages above 40 are 57

(11.0%) and 10 (2.0%) respectively. The interview conducted with the questionnaire noted most children are of low socio-economic background living in overcrowded environment and sharing their residential houses with domestic animals such as cat, dog, goat and sheep. This could be the source of zoophilic organisms such as *T. mentagrophyte* and *T. verrucosum*. These forms of dermatophytes infection were prevalent especially among children below 15 years of age (Monicka *et al.*, 2016).

It was noted that most of the infected children do not barb their hair and the questionnaire revealed that they mostly have their bath twice per week. They thereby create humid conditions which favoured the growth of the dermatophytes spores. The nature of the job done by participants occurred mostly in school children category population.

This could be explained on the part of the pupils due to the role of excessive playing and extensive sweating that invites infection. The reason behind this may be due to their life style such as large size of the family, sharing of clothing or towels and playing with sand tendency of children. Ansarin *et al.* (2001).

CONCLUSION

This study shows that the climatic conditions of Ondo North senatorial district favour dermatophytosis in the population. Dermatophytosis is a common public health problem affecting all age group especially the school pupils and they rarely seek medical advice for the treatment. Tinea capitis was the most frequently encountered clinical condition followed by tinea pedis. *T. mentagrophyte* was implicated as the predominating species followed by *T. rubrum* and *M. gypseum*. Dermatophytosis was more common in less educated maintaining adequate personal and environmental hygiene at homes. Combined efforts of teachers, parents as well as local, State and Federal government

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- people. Unhygienic conditions among low socio-economic group, overcrowding and poor personal hygiene are some of the contributing epidemiological factors.
- Evidence from this study, establishes the fact that dermatophytosis occur mostly in children of different age groups and sex. Therefore, routine inspection of school children, and adequate health education should be mounted in schools, especially primary schools and the society at large. Parents are to be educated on
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