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Epidemiological status of dermatophytosis among rice farmers in Ebonyi State, Nigeria

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ABSTRACT

Dermatophytosis caused by dermatophytic fungi is highly contagious and represents significant public health problem in Nigeria and the world at large. The infection among rice farmers had not received much attention; hence, the epidemiology of dermatophytosis among rice farmers in Ebonyi State was studied. A total of 2130 rice farmers were randomly selected and screened for dermatophytosis. Hair fragments, skin and nail scrapings were collected from 182 rice farmers that presented with lesions suggestive of the infection using sterile scissors and scalpels. The samples were examined by direct microscopy using 5% KOH and cultured on Sabouraud dextrose agar supplemented with 0.05 mg/mL chloramphenicol and 0.5 mg/mL cycloheximide and incubated at 28 °C ± 2 °C for 7 days. The dermatophytes isolated were identified by macroscopic and microscopic methods and confirmed by molecular analysis. Demographic data and factors influencing the infection were obtained through questionnaires and analyzed using analysis of variance (ANOVA) at $p<0.05$ significant level with SPSS version 22. A total of 54 dermatophyte species were recovered from the samples. Dermatophytes isolated included *Trichophyton tonsurans* 23 (42.59%), *Trichophyton mentagrophytes* 14 (25.93%), *Trichophyton rubrum* 7 (12.96%), *Trichophyton soudanense* 5 (9.26%), *Microsporum gypseum* 3 (5.56%) and *Microsporum canis* 2 (3.70%). Age, gender, educational status and family size of the farmers and their interactions with domestic animals influenced the distribution of dermatophyte species isolated. Out of 182 rice farmers screened, the age-group 16-26 years were most infected with the infection 71 (39.01%), followed by 39 (21.43%) between the age-group 27-37 years and a decline between the age-group 49-59 years 15 (8.24%). The females were more infected 144 (79.12%) than the

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males 38 (20.88%). The infection among the females was found to be significant (P<0.05). Among the skin infections observed in the study areas, tinea capitis 76 (41.76%) was the most predominant type of infection followed by tinea unguium (onychomycosis) 59 (32.42%) and tinea corporis 47 (25.82%). It is expected that the study will be an eye-opener to the government, non-governmental organizations as well as community-based organizations to execute various intervention programmes like public health education and improved farming conditions to help reduce the burden of the infection in the area.

***Keywords*:** epidemiology, dermatophytosis, contagious, public health, rice farmers, *Trichophyton tonsurans, Trichophyton mentagrophytes, Trichophyton rubrum, Trichophyton soudanense, Microsporum gypseum, Microsporum canis*

1. INTRODUCTION

Dermatophytes are a group of closely related filamentous fungi that cause dermatophytosis (Peerapur *et al*., 2004). Dermatophytosis (Plural, dermatophytoses) is a cutaneous mycotic condition characterized by the infection of keratinized tissues such as the skin, hair and nails. *Trichophyton, Microsporum* and *Epidermophyton* are the genera of dermatophytes implicated in dermatophytosis and are related to organisms in the soil which are capable of digesting keratinous material. They tend to grow outwards on skin, producing a circular rash (shaped like a ring), hence the term 'ringworm'. They are very common and affect different parts of the body.

The transmission of dermatophytosis occurs by direct contact with infected animals and humans or by indirect contact with contaminated fomites. The causative fungi produce keratinases which degrade the keratin and thus, invade the cutaneous skin tissue. The infections due to these pathogens are generally cutaneous and restricted to the non-living, cornified layers of the skin. However, in chronic conditions, the fungi may invade deeper tissues, particularly in concurrent infections with other organisms. The clinical forms vary according to the etiologic agent and the anatomical site involved. Symptoms may be mild or severe based on the host's immunologic condition and invasion of subcutaneous tissues or internal organs normally do not occur. Typical lesions of skin infections are circular, erythematous, pruritic and are the results of direct action of the fungus or hypersensitivity reactions to the microorganisms and/or their metabolic products. In nail infections (onychomycosis), the nail may separate from its bed, may become thick and have white spots or even become dystrophic (Degreef, 2008).

Dermatophytosis is highly contagious and represents a significant public health problem in Nigeria (Anosike *et al*., 2005). Generally, the infection has been reported worldwide, though with variation in distribution, incidence, epidemiology, etiology and hosts from one location to another with time. Host susceptibility may be enhanced by age, exposure, personal hygiene, geographical location, climatic factors, social practices, crowded living conditions and socioeconomic status (Shenoi *et al*., 2005; Oyeka and Eze, 2008). Rice farmers are at high risk of dermatophytosis because of their occupational contact with soil. These farmers are exposed to various irritant agents, namely: mud, cow dung or other types of manure, fertilizers and dust which predispose them to the infection (Oyeka and Okoli, 2003; Efuntoye *et al.*, 2011). In addition, during the ploughing and planting season and sometimes in the harvesting season, their feet are constantly immersed in water. This factor can also predispose them to dermatophytosis of the skin, hair and nail (Shenoi *et al*., 2005).

There is paucity of epidemiological data in the literature to ascertain the epidemiology of dermatophytosis among rice farmers in parts of Ebonyi State. Thus, studies in different parts of Ebonyi State assessing the specific fungal etiology involved are of public health importance serving as baseline information for the management of the infection at the local level.

2. MATERIALS AND METHODS

2. 1. Collection of Samples

The study was approved by the Ethical Committee of the Federal Teaching Hospital, Abakiliki and an informed consent was taken prior to the collection of samples. Ikwo and Izzi Local Government Areas of Ebonyi State were chosen for this study. Samples were collected during field visits undertaken during the transplanting and harvesting seasons (June, 2015-November, 2016). Samples were also collected during house-to-house visit with the help of a guide who knew the local residents involved in rice field work. The farmers were randomly chosen and interviewed.

A total of 2130 rice farmers, including adults and children, were screened for lesions suggestive of dermatophytosis on their skin, hair and nails. The lesions were evaluated for scaling, fissuring, redness of the skin and dystrophy of the nails. For obtaining the samples aseptically, the infected areas or lesions were cleaned with cotton wool soaked in 70% ethanol before collecting scrapings from the affected areas using sterile scalpels. The scrapings were put into drug dispensary polythene bags and transported to Imo State University Owerri, Microbiology Laboratory for examination. The examination was carried out within 1 to 3 days. The information about the age, gender, location of lesion, educational level, size of family, interaction with domestic animals and applications of antifungal therapy was obtained through questionnaire.

2. 2. Examination of Direct KOH Mount

Direct microscopic examination was carried out as described by Cheesbrough (2010). A part of the hair follicles, scrapings of skin and nails was treated with two drops of a 5% potassium hydroxide (KOH) using a sterile forceps for 10 minutes to allow clearing of epithelial tissue surrounding the fungi so that the fungal structures can be exposed. The preparation was mounted on a clean glass slide and examined by direct microscopy for the presence of fungal hyphae and arthrospores under low power (10×) and high power (40×) magnification. The positive samples were processed for the isolation of dermatophyte species on Sabouraud Dextrose Agar (SDA; Lab M).

2. 3. Isolation of Dermatophytes

Culture of samples was carried out as described by Cheesbrough (2010). A portion of the sample was inoculated on the prepared culture media - SDA supplemented with 0.5 mg/mL cycloheximide (Sigma, USA) and 0.05 mg/mL chloramphenicol (Yangzhou, China) in duplicates using spot inoculation technique. The inoculated plates were incubated at room temperature (28 °C ± 2 °C) for 7 days, where fungal growth was observed. The organism was subcultured onto fresh media to obtain pure isolates used for identification.

2. 4. Identification of Fungal Isolates

Preliminary identification of the fungal isolates was carried out based on detailed conventional methods: colony morphology, pigmentation on reverse side of colony, growth rate, slide culture, hair perforation, urease test and rice grain test. The morphologies were compared with the standard description given by *Ellis et al. (2007).* Confirmatory identification of the fungal isolates was done by sequencing the internal transcribed spacer (ITS) region of the ribosomal DNA.

2. 5. Statistical Analysis

The distribution of dermatophyte species among rice farmers in Ebonyi State was expressed in percentage. In order to establish association of age, gender, educational level, size of family and interaction with domestic animals location of lesion with epidemiology of dermatophytosis among the farmers, the analysis of variance (ANOVA) statistical test was used at $p<0.05$ significant level.

3. RESULTS

3. 1. Demographic Characteristics of Rice Farmers with Dermatophytosis

A total of 2130 rice farmers were sampled from Ikwo and Izzi Local Government Areas of Ebonyi State. Of the 2130 rice farmers screened, only 182 persons presented with lesions suggestive of dermatophytosis and comprised 22 (12.09%) males and 90 (49.45%) females in Ikwo LGA (Table 1) and 16 (8.79%) males and 54 (29.67%) females in Izzi LGA (**Tables 1** and **2**). The Tables showed that the females were more infected with dermatophytosis than their male counterparts. The 16-26 years age group was the most infected with the infection in both Ikwo LGA 48 (26.37%) and Izzi LGA 23 (12.64%).

3. 2. Isolation and Identification of Fungi

Of the 182 samples collected, 106 were positive by KOH mount whereas all the samples collected were positive by culture. The positive KOH mount showed fragments of septate and nonseptate hyphae. A total of 54 dermatophyte species were recovered from the samples. Dermatophytes isolated included *Trichophyton tonsurans, T. mentagrophytes, T. rubrum, T. soudanense, Microsporum gypseum* and *M. canis*.

3. 3. Distribution of Dermatophyte species

Trichophyton tonsurans was the predominant dermatophyte species found in 26.63% (16/54) cases of dermatophytes isolated in Ikwo LGA, followed by *T. mentagrophytes* 16.67% (9/54), *T. rubrum* 5.56% (3/54), *T. soudanense* 5.56% (3/54), *Microsporum gypseum* 1.85% (1/54) and 1.85% (1/54) cases of *M. canis* (**Figure 1**). The distribution of dermatophyte species isolated in Izzi LGA also showed that *T. tonsurans* was the predominant dermatophyte species 12.96% (7/54), followed by *T. mentagrophytes* 9.26% (5/54), *T. rubrum* 7.41% (4/54), 3.70% (2/54) cases each of *T. soudanense* and *M. gypseum*, and *M. canis* 1.85% (1/54) (**Figure 2**).

The distribution of dermatophytic fungi, based on age groups in Ikwo and Izzi LGAs, showed an increase in the percentage frequency of dermatophyte species between ages 16-26 years 13 (24.07%), followed by 27-37 years 8 (14.81%), 5-15 years 6 (11.11%), 38-48 years 5

(9.26%) and a decline between ages 49-59 years 1 (1.85%) in Ikwo LGA than in Izzi LGA with age-group 16-26 years 7 (12.96%), 27-37 years 6 (11.11%), 38-48 years 4 (7.41%) and a decline between ages 5-15 years 2 (3.70%) and 49-59 years 2 (3.70%). *T. tonsurans* caused infection in all age groups examined in the study. The age-group 16-26 years was most infected with *T. tonsurans* 7 (12.96%) and *T. mentagrophytes* 3 (5.56%) in Ikwo LGA and Izzi LGA, respectively (**Table 3**). Statistical analyses revealed significant difference ($P<0.05$) in the distribution of dermatophytosis among rice farmers in all age groups.

The gender-specific distribution of dermatophytic fungi in Ikwo LGA was 10 (18.52%) and 23 (42.59%) while the distribution of dermatophytic fungi in Izzi LGA was 5 (9.26%) and 16 (29.63%) for male and female farmers, respectively. The females were more infected with dermatophytic fungi in both LGAs (**Table 4**) and *T. tonsurans* was the most frequently isolated species in Ikwo LGA 12 (22.22%) and Izzi LGA 6 (11.11%). Comparison of the distribution of dermatophytosis of males and females showed that female rice farmers had a significantly higher ($P<0.05$) prevalence rate.

Table 5 shows the distribution of dermatophytic fungi according to educational status of rice farmers examined. Lower percentage frequency 1 (1.85%) of dermatophytic fungi was observed among rice farmers with tertiary education in both Ikwo and Izzi LGAs. Both Ikwo and Izzi LGAs recorded 4 (7.41%) among rice farmers with secondary education whereas rice farmers with primary education recorded 12 (22.22%) and 5 (9.26%) in Ikwo and Izzi LGAs, respectively. Rice farmers with no formal education recorded the highest frequencies 16 (29.63%) and 11 (20.37%) of dermatophytic fungi in Ikwo and Izzi LGAs, respectively. Higher frequency of dermatophytic fungi was observed among rice farmers in Ikwo LGA than Izzi LGA. *T. tonsurans* occurred mostly among rice farmers with no formal education in Ikwo LGA 9 (16.67%) than Izzi LGA 5 (9.26%) while *T. mentagrophytes* occurred mostly among rice farmers with primary education in Ikwo LGA 5 (9.26%) than Izzi LGA 1 (1.85%).

The distribution of dermatophyte species, based on family size of the rice farmers, showed the highest percentage frequency 13 (24.07%) of dermatophytic fungi in Ikwo LGA from those with families of 12-14 persons, followed by 10 (18.52%), 7 (12.96%) and 3 (5.56%) from those with families of 9-11, 6-8 and 3-5 persons, respectively, compared to 9 (16.67%), 7 (12.56%), 4 (7.41%) and 1 (1.85%) among those with families of 12-14, 9-11, 6-8 and 3-5 persons, respectively, in Izzi LGA. The infection was reported more among families living in crowded accommodation. *T. tonsurans* and *T. mentagrophytes* were isolated from all family sizes of rice farmers examined in Ikwo and Izzi LGAs except with families of 3-5 persons (**Table 6**). *T. tonsurans* was the most frequently isolated species from rice farmers with family size of 12-14 persons in Ikwo LGA 8 (14.81%) than Izzi LGA 3 (5.56%). *M. canis* only caused infection on rice farmers with families of 9-11 persons 1 (1.85%) in both Ikwo and Izzi LGAs.

The infection was also reported among those that interact with domestic animals such as dogs, cats, goats, rabbits and poultry birds. The highest percentage frequencies 21 (38.89%) and 12 (22.22%) of dermatophytic fungi were observed among rice farmers with no interaction with domestic animals in Ikwo and Izzi LGAs, respectively, compared to rice farmers with interaction with domestic animals (**Tables 7** and **8**). The locations of dermatophytic lesions and the dermatophyte species isolated are presented in **Table 9**. The Table showed that the hair/scalp (tinea capitis) 76 (41.76%) was the commonest affected site of the body among the suspected cases. This was followed by the nail (tinea unguium) 59 (32.42%) and the skin (tinea corporis) 47 (25.82%). *T. tonsurans* and *T. rubrum* were recovered from all body sites examined in the study. **Figure 3** shows the dermatophytic lesions observed among rice farmers in Ikwo

and Izzi LGA. The majority of the farmers examined in Ikwo LGA had scales 36 (19.78%); other work-related symptoms were nail dystrophy 27 (14.84%), erythema 16 (8.79%) and fissures 11 (6.04%). Izzi LGA recorded the following: scales 20 (10.99%), nail dystrophy 16 (8.79%), erythema 13 (7.14%) and fissures 4 (2.20%). Twenty-two farmers (12.09%) complained of itching during and after work, especially during harvesting and thrashing in Ikwo LGA whereas Izzi recorded 17 (9.34%). These dermatoses were less common among farmers in Izzi LGA (**Table 10**).

Table 1. Demographic characteristics of rice farmers, presented with lesions suggestive of dermatophytosis in Ikwo LGA of Ebonyi State

Age Groups (Years)	Gender Male	Female	Number of samples collected
5-15	1	9	10 (5.50)
16-26	5	43	48 (26.37)
27-37	10	11	21 (11.53)
38-48	3	20	23 (12.64)
49-59	3	7	10 (5.50)
Total	22 (12.09)	90 (49.45)	112 (61.54)

Table 2. Demographic characteristics of rice farmers, presented with lesions suggestive of dermatophytosis in Izzi LGA of Ebonyi State

Age Groups of samples (Years)	Gender Male (%)	Female (%)	Number collected (%)
5-15	1	8	9 (4.45)
16-26	2	21	23 (12.64)
27-37	7	11	18 (9.89)
38-48	5	10	15 (8.24)
49-59	1	4	5 (2.74)
Total	16 (8.79)	54 (29.67)	70 (38.46)

Table 3. Age distribution of dermatophyte species among rice farmers in Ikwo and Izzi LGAs

Dermatophyte species	Age Groups (Years)									
	5-15		16-26		27-37		38-48		49-59	
	Ikwo	Izzi	Ikwo	Izzi	Ikwo	Izzi	Ikwo	Izzi	Ikwo	Izzi
T. tonsurans	3	1	7	2	4	1	1	2	1	1
T. mentagrophytes	2	-	3	3	3	1	1	1	-	-

T. rubrum	1	-	2	1	-	2	-	1	-	-
T. soudanense	-	-	1	1	1	-	1	-	-	-
M. gypseum	-	-	-	-	-	2	1	-	-	1
M. canis	-	1	-	-	-	-	1	-	-	-
Total (%)	6(11.11)	2(3.70)	13(24.07)	7(12.96)	8(14.81)	6(11.11)	5(9.26)	4(7.41)	1(1.85)	2(3.70)

Table 4. Gender distribution of dermatophyte species among rice farmers in Ikwo and Izzi LGAs of Ebonyi State

Dermatophyte species	Ikwo		Izzi	
	Male	Female	Male	Female
T. tonsurans	4	12	1	6
T. mentagrophytes	2	7	3	2
T. rubrum	2	1	-	4
T. soudanense	1	2	-	2
M. gypseum	1	-	-	2
M. canis	-	1	1	-
Total (%)	10 (18.52)	23 (42.59)	5 (9.26)	16 (29.63)

Table 5. Educational status of rice farmers with dermatophytosis in Ikwo and Izzi LGAs of Ebonyi State

Dermatophyte species	**Primary**		**Secondary**		**Tertiary**		**No Education**	
	Ikwo	Izzi	Ikwo	Izzi	Ikwo	Izzi	Ikwo	Izzi
T. tonsurans	4	1	2	1	1	-	9	5
T. mentagrophytes	5	1	1	2	-	-	3	2
T. rubrum	2	1	-	1	-	1	1	1
T. soudanense	1	1	1	-	-	-	1	1
M. gypseum	-	1	-	-	-	-	1	1
M. canis	-	-	-	-	-	-	1	1
Total (%)	12(22.22)	5(9.26)	4(7.41)	4(7.41)	1(1.85)	1(1.85)	16(29.63)	11(20.37)

Table 6. Distribution of dermatophyte species based on family size of rice farmers in Ikwo and Izzi LGAs of Ebonyi State

Dermatophyte species	Family Size							
	3-5		6-8		9-11		12-14	
	Ikwo	Izzi	Ikwo	Izzi	Ikwo	Izzi	Ikwo	Izzi
T. tonsurans	-	1	3	1	5	2	8	3
T. mentagrophytes	2	-	1	2	3	2	3	1
T. rubrum	1	-	1	1	1	1	-	2
T. soudanense	-	-	1	-	-	1	2	1
M. gypseum	-	-	1	-	-	-	-	2
M. canis	-	-	-	-	1	1	-	-
Total (%)	3(5.56)	1(1.85)	7(12.96)	4(7.41)	10(18.52)	7(12.96)	13(24.07)	9(16.67)

Table 7. Percentage distribution of dermatophytic fungi among rice farmers in Ikwo LGA based on their interactions with domestic animals

Domestic Animals	Dermatophyte species	No. of Rice Farmers	No. of Isolates (%)
Goats	*T. tonsurans* (1) *T. mentagrophytes* (2)	3	3 (5.56)
Poultry	*T. tonsurans* (2) *T. mentagrophytes* (2) *T. soudanense* (1) *T. rubrum* (1)	6	6 (11.11)
Dogs	*M. canis* (1)	1	1 (1.85)
Cats	*T. mentagrophytes* (1)	1	1 (1.85)
Rabbits	*T. rubrum* (1)	1	1 (1.85)
No animal interaction (soil and wet works)	*T. tonsurans* (11) *T. rubrum* (2) *T. mentagrophytes* (2) *T. soudanense* (3) *M. gypseum* (1)	21	21 (38.89)
Total			33 (61.11)

Table 8. Percentage distribution of dermatophytic fungi among rice farmers in Izzi LGA based on their interactions with domestic animals

Domestic Animals	Dermatophyte species	No. of Rice Farmers	No. of Isolates (%)
Goats	*T. tonsurans* (1)	1	1 (1.85)
Poultry	*T. tonsurans* (2) *T. mentagrophytes* (1)	3	3 (5.56)
Dogs	*T. rubrum* (1)	1	1 (1.85)

Cats	*M. canis* (1)	1	1 (1.85)
	M. canis (1)		
Rabbits	*T. mentagrophytes* (1)	2	3 (5.56)
	T. rubrum (1)		
	M. gypseum (1)		
No animal interaction (soil and wet works)	*T. tonsurans* (5)	10	12 (22.22)
	T. rubrum (1)		
	T. mentagrophytes (4)		
	T. soudanense (1)		
	M. gypseum (1)		
Total			21 (38.89)

Table 9. Distribution of dermatophyte species according to body sites affected

Body site affected	**No. sampled (%)**	**Dermatophyte species isolated**
Hair/scalp	76 (41.76)	*T. tonsurans, T. mentagrophytes, T. rubrum, T. soudanense, M. gypseum, M. canis*
Nail	59 (32.42)	*T. tonsurans, T. rubrum*
Skin	47 (25.82)	*T. tonsurans, T. rubrum, M. gypseum, M. canis*
Total	182 (100.00)	

Table 10. Dermatophytosis observed among the farmers in Ikwo and Izzi LGAs of Ebonyi State

Dermatophytosis	**Ikwo (%)**	**Izzi (%)**
Scaling	36	20
Erythema	16	13
Itching	22	17
Nail dystrophy	27	16
Fissures	11	4
Total	112 (61.54)	70 (38.46)

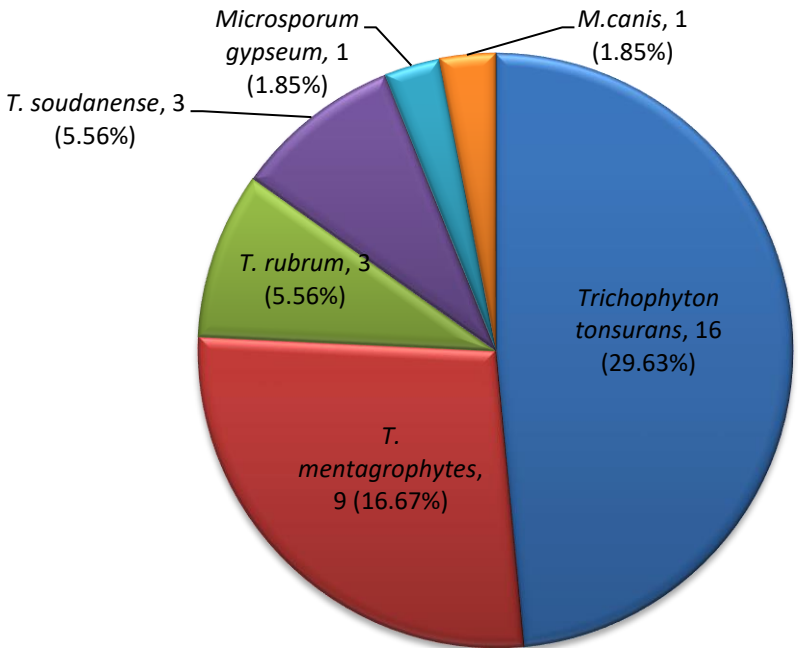

Figure 1. Percentage distribution of dermatophyte species isolated from rice farmers in Ikwo LGA of Ebonyi State

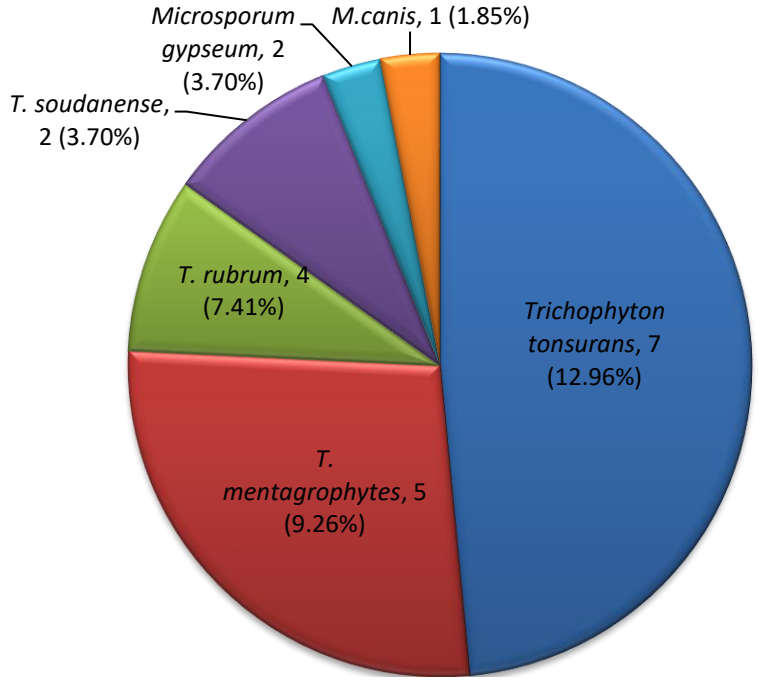

Figure 2. Percentage distribution of dermatophyte species isolated from rice farmers in Izzi LGA of Ebonyi State

Figure 3. Dermatophytic lesions observed

4. DISCUSSION

Dermatophytosis constitutes an important public health problem among rice farmers worldwide, including Nigeria. This infection remains endemic in Nigeria, largely because of lack of information on its epidemiology and absence of control measures (Anosike *et al*., 2005). The present study highlights the epidemiology of dermatophytosis among rice farmers in Ebonyi State, Nigeria. Ikwo and Izzi, the two Local Government Area chosen for the study have relatively higher population density consisting primarily of rice farmers.

The study revealed that 182 of rice farmers in a random population of 2130 farmers were infected with various species of dermatophytic fungi. The percentage occurrence of dermatophyte species observed in the study was insignificant and was unexpected because almost all parameters known to favour person-to-person transmission, such as the presence of skin lesions, practice of sharing personal belonging, overcrowding in the home, practice of keeping domestic animals and factors that suggest unhygienic life style of the community with low socio-economic background are present in the rice farmers surveyed. Moreover, rice farming is generally associated with higher risk of developing dermatophytosis, both due to contact with many potential sources of infection such as animals, soil and wet work which promote infection (Sunil, 2002; Oyeka and Okoli, 2003; Shenoi *et al*., 2005; Efuntoye *et al.*, 2011). Similar observations were reported from a study among rice farmers in Anambra State (Ekwealor and Oyeka, 2013). The low prevalence may be due to variation in environmental and climatic conditions favourable for the growth of the pathogens in the area studied. Another possible explanation for the low percentage occurrence of dermatophyte species observed in this study is that the study only looked at those with detectable signs of fungal infection. This has the potential of missing asymptomatic carriers.

T. tonsurans was the predominant dermatophyte species followed by *T. mentagrophytes* and *T. rubrum*. It can be deduced that *T. tonsurans* was the major etiologic agent of dermatophytosis among rice farmers in the study area. The finding of *T. tonsurans* as the predominant dermatophyte species was at variance with similar research by Ekwealor and Oyeka (2013) who reported *T. rubrum* as the commonest etiologic agent of cutaneous mycoses in Anambra State. However, because no such study had been previously carried out in the study area among the studied population, the assertion of a variation in etiology is possible.

Although rice farmers of all ages were susceptible to dermatophytosis, most of them belonged to the age group 16-26 years. Similar observation was made by Ekwealor and Oyeka (2013). The age group 16-30 years is more actively involved in rice farming and exposed to the hot and humid climate than the younger and older age groups and tends to sweat more. Gender-related studies on the epidemiology of dermatophytosis consist of fragments, with some studies claiming that males predominate (Nweze, 2001; Ali-Shtayeh *et al.* 2002) while in some, it is the females (Omar, 2000; Anosike *et al*., 2005; East-Innis *et al*., 2006). This study found more females than males infected with dermatophytosis. The probable reason for the higher occurrence of dermatophytosis amongst females in the study could be because there were more females that presented with the infection.

The present study showed a relationship between the level of education and the occurrence of dermatophytosis in the population studied. Low frequency of dermatophyte species were observed among rice farmers who had formal education compared to those without formal education. A study in Iraq revealed a higher occurrence of fungal infections in families which had parents with no formal education or low level of education (Fathi and Al-Samarai,

2000), though the study was not amongst rice farmers. Poor personal hygiene and illiteracy are other major factors that influence dermatophytosis in this part of the country.

The infection was reported more among families living in crowded accommodation and those that interacted with domestic animals such as dogs, cats, goats, rabbits and poultry birds. The reports of Gugnani and Oyeka (1989) support the findings of this study. It was observed that families share their residential houses with domestic animals; however, rice farmers with no interaction with domestic animals were more infected. Unhygienic conditions among these farmers may be one of the contributing epidemiological factors influencing transmission of infection (Oyeka and Gugnani, 1992). *T. tonsurans* and *T. rubrum* were isolated from all three affected body sites examined in the study. The finding of *T. rubrum* as a common agent of dermatophytosis of different parts of the body in the study area was in agreement with similar research by Ekwealor and Oyeka (2013) who reported *T. rubrum* as the most common agent of cutaneous mycoses of different parts of the body. The results of the study showed that scalp infections were more frequent than nail infections. It was observed that some of the farmers used footwears in the fields whereas most of the farmers did not use hand gloves during their farm work. It can therefore be deduced that the occurrence of tinea capitis was much higher in the study population. This was followed by tinea unguium and tinea corporis. This disagrees with the findings of Ekwealor and Oyeka (2013) who reported a high rate of infection of the finger and toe nail among rice farmers in Anambra State, Nigeria. This disagrees also with the findings of Shenoi *et al*. (2005) who reported a high rate of nail infection among paddy field workers in India. Scalp infection was mostly seen in children. This can be attributed to the fact that children are also involved in rice farming.

5. CONCLUSION

In this study, dermatophytosis caused by dermatophyte species was observed to be less common among rice farmers than we had expected. *T. tonsurans* was the most predominant dermatophyte species which validates etiologic agent variation with respect to a particular geographical location, socioeconomic status and life style of the studied population. Age, gender, educational status, family size of the farmers and their interactions with domestic animals influenced transmission of the infection. Among the tinea infections observed in the community, tinea capitis was the most common type of infection followed by tinea unguium (onychomycosis) and tinea corporis. The study will serve as an eye-opener to the government, non-governmental organizations as well as community-based organizations to execute various intervention programmes like public health education, improved working conditions, housing and sanitary standards, accessible potable water, protective equipment such as long rubber boots, masks and gloves, periodic surveillance and economic stability to help reduce the burden of the infection in the area.

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