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Changing Epidemiology of Superficial Fungal Infections in Enugu, South East Nigeria

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Abstract

Background: Superficial fungal infections are encountered worldwide but predominate in low and middle in-come countries. It has a high morbidity rate and affects the quality of life. Its epidemiology is changing because of influence of socioeconomic factors, modern life style, immunosuppressive therapy, travel and migration of populations. This study was carried out with the aim to survey the changing epidemiology of superficial fungal infection in Enugu, South East Nigeria.

Methods: This was a hospital based cross-sectional study, carried out in the Department of Medical Microbiology, University of Nigeria Teaching Hospital Enugu. Information regarding the age, sex, preliminary diagnosis and site of infections were gotten from the patients records. A total of 566 clinical specimens were collected from the patients diagnosed with superficial mycosis. The specimens were collected unto a piece of white paper and examined microscopically using potassium hydroxide. They were then cultured on Sabouraud Dextrose Agar (SDA) and incubated at 25°C and 37°C for one month. Fungi identification was based on macroscopic and microscopic examination.

Results: Out of 253 fungi isolated from the clinical specimens, 141 (55.7%) were dermatophytes, with the least being *Candida* species 32 (12.6%) (Kruskal-Wallis H (6)=4.571; P=0.102). Females: male ratio was 1.3:1. Above 25 years, the isolates were higher in female. (χ^2=21.249, P=0.003). Among the dermatophytes, *Trichophyton soudanense* 56 (22.1%) was the predominant isolate, followed by *Trichophyton rubrum* 51 (20.16%). (χ^2=5.056; P=0.034). The predominant non-dermatophytes isolated were *Cladosporum* Species 48 (18.0%). The trunk 112 (44.3%) was the most affected site, with the least affected site being the hand 4 (1.6%).

Conclusion: The high rate of previously rare fungi isolated calls for serious surveillance. This study reflects the changing trend of superficial fungal infection with a high rate of isolation of non-dermatophyte.

Keywords: Dermatophytes; Fungi; Infection; Superficial; Species; Sabouraud dextrose agar

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Introduction

Fungal infections are very significant diseases posing a major public health problem globally. Superficial mycosis is a fungal infection of the stratum corneum, hair and nails [1]. According to world health organization, superficial mycosis globally, affects about 20% to 25% of the world population [2-4] with the burden more in low and middle in-come countries. The prevalence of superficial mycosis infection in Nigeria is reported to range from 3.5%-55% depending on the population and geographical location studied [4-6]. Although the infection rarely causes mortality, they can affect the quality of life through dermal inflammatory skin reaction, poor cosmetics appearance and social stigmatization [7]. In recent times, there have been reports on the increasing incidence of superficial mycosis, making them to be a frequent reason for visits to dermatological clinic in the hospital. This

increase has been attributed to indiscriminate use of antibiotics, increased anticancer therapy, immune deficient diseases and drugs [8]. Most patients at the initial stage may feel reluctant to seek medical treatment unless the condition becomes sufficiently serious to affect the quality of life. Additionally, bacteria secondary infections and allergy can complicate chronic superficial fungal infection. Chronic and debilitating health conditions have also been implicated as risk factors in the acquisition of superficial mycosis [9].

The infection is extremely common in the hot and humid climate of tropical and sub-tropical regions like Nigeria. This is so, because of the environmental conditions like the increased temperature and humidity which favour the growth of fungi [2,8] together with large population size, low socioeconomic status and inadequate health facilities [10].

Superficial fungal infections are caused by dermatophytes, non-dermatophytes and *Candida* species, with variations in rates from one geographical location to another [11,12]. Many studies have reported dermatophytes as the most common aetiologic agent [8,13] and the infection they cause is commonly referred to as 'tinea' in clinical practice [14,15]. Recently, the incidence of non-dermatophyte fungi is gradually increasing and they produce lesions clinically similar to those caused by dermatophytes [16].

The epidemiological trends of superficial mycoses in a previous study done 15 years ago, in Enugu reported *Trichophyton soudanense* and *T. mentagrophyte* as the commonest agents [17]. Few reports are available on non-dermatophytic fungi as causes of superficial mycoses from this part of the country. Moreover, it has also been documented that aetiological agents vary from time to time [6]. This variation is attributed to changes with migration, lifestyle, immunosuppressive therapy, and socioeconomic conditions [2,4]. Surveillance is the key to good clinical practice, thus it is imperative to ascertain the current prevalence of superficial mycosis in our institution. This present study was designed with the aim of monitoring the changing epidemiology of superficial fungal infection in patients attending University of Nigeria Teaching Hospital (UNTH) Enugu. The data will provide current information on superficial fungal infection and will also help in a better management of the patient as well as adding to the global epidemiological data.

Materials and Methods

Study design

This was a hospital based cross-sectional study carried out from December 2015 to June 2019 in the Department of Medical Microbiology, University of Nigeria Teaching Hospital Enugu. Ethical approval was gotten from Health Ethical committee of UNTH Ituku-Ozalla. The details of patients diagnosed with superficial fungal infections were extracted from the patient's records and analysed with SPSS version 22. The information extracted was demographic data (age and sex), diagnoses, site of infections and fungi isolated were gotten from the patients records.

Specimen collection

A total of 566 clinical specimens were collected from the patients diagnosed with superficial fungal infection during the period of study. Routinely in the laboratory, the affected areas of the body were disinfected with 70% alcohol and allowed to air dry. The affected skin sites were scraped from the advancing border of the lesions using blunt sterile scalpels. The affected nails were clipped and discolored/friable areas were also scrapped. In collecting the hair specimens, 10-15 infected hairs were plucked as well as scrapping the active border on the surrounding scalp. All the specimens collected were wrapped in sterile white papers and put into sterile petri dishes with lids.

Microscopic examination

The scraped specimens from the different lesions were placed in 2 drops of 10% potassium hydroxide solution with 40% di-methyl sulphoxide on clean grease free glass slides. The preparations were then covered with cover slips and viewed under the microscope for the presence of unstained refractile fungal elements.

Fungal culture and identification

The culture was done with sabouraud's dextrose agar (Oxiod, UK) media slants supplemented with chloramphenicol (16 µg/mL), gentamicin (5 µg/mL) and cycloheximide (500 mg/L) in McCartney bottles. The culture bottles were incubated at 25°C and 37°C, and observed for fungal growth twice a week. The culture bottles without growth were allowed to stay for one month before discarding as negative if no growth was observed. Fungi identification was based on the macroscopic features of colony morphology and presence/absence of pigmentations followed by microscopic examination. The microscopic examination was done by removing a portion of mycelium with a sterile straight wire, placed in a drop of lactophenol cotton blue on a clean grease free glass slide. The preparation was covered with a cover slip and viewed with low power and high power objectives. Fungi identifications were done after observing their macro and micro characteristics.

Data Analysis

The data obtained were entered and analysed using statistical package for social sciences version 25.0 (SPSS, IBM Corporation, Armonk, NY, USA) and MS Excel. The data were analysed with descriptive statistics, frequency distribution and cross tabulation of key variables. Comparison of the isolates was done with Chi-test and Kruskal-Wallis H test. The level of statistical significance for all the tests was at P-value <0.05.

Results

Two hundred and fifty-three samples were positive for fungal growth, out of 566 samples that were analysed. Females 142(56.1%) accounted for slightly more than half of the population with a ratio of 1.3:1. (Kruskal-Wallis H (6)=4.571; P=0.102).

Below 24 years, the isolates were higher in male, however, from 25 years and above, the isolates in females became higher.

(χ^2=21.249, P=0.003). Particularly, age group 35-44 years had the highest rate, followed by 25-34 years (Figure 1).

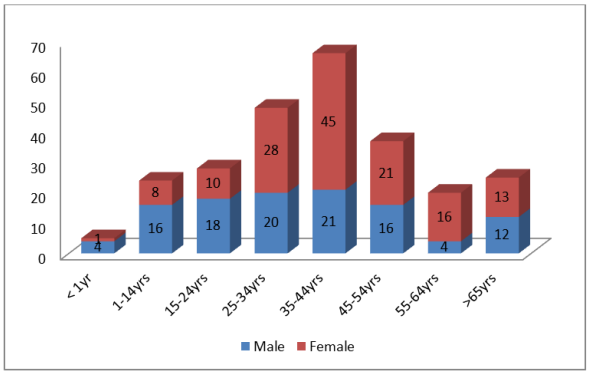

Figure 1: Age distribution of the population studied according to their gender. The distribution of the population studied according to their age groups and gender with the red color denoting female while the blue color represented the males.

Among the isolated fungi organisms, 135 (53.4%) were dermatophytes with the least isolated fungi being *Candida* Species 32 (12.7%).

Among the dermatophytes, *Trichophyton soudanense* 56 (22.1%) was the predominant isolate, followed by *Trichophyton rubrum* 51 (20.16%). The least isolated dermatophytes were *E. floccosum* (0.8%) and *T. tonsurans* (0.80%), which were seen only in females. There is no statistical significant difference among the isolated dermatophytes across the gender (χ^2=5.056; P=0.034).

Among the non-dermatophytes 118 (46.6%), *Cladosporum* Species 48 (18.0%) predominated, followed by *Malazezzia furfur* 10 (3.95%) (Table 1). The least isolated non-dermatophytes was *Fusarium* Species 2 (0.79%) seen in only females. *Candid* species was isolated in 32 (12.70%) of the patients.

Organisms	Male (%)	Female (%)	Total (%)
Non-Dermatophytes			
Cladosporium spp	19 (7.51%)	29 (11.46%)	48 (18.97%)
Malazezzia furfur	3 (1.19%)	7 (2.77%)	10 (3.95%)
Aspergillus niger	4 (1.58%)	3 (1.19%)	7 (2.77%)
Penicillium spp	4 (1.58%)	2 (0.79%)	6 (2.37%)
Aspergillus flavus	1 (0.40%)	4 (1.58%)	5 (1.98%)
Curvularia spp	4 (1.58%)	-	4 (1.58%)
Aspergillus fumigatus	1 (0.40%)	3 (1.19%)	4 (1.58%)
Fusarium spp	-	2 (0.79%)	2 (0.79%)
Candida spp	13 (5.14%)	19 (7.51%)	32 (12.65%)
Dermatophytes			
Trichophyton soudanense	30 (11.86%)	26 (10.28%)	56 (22.13%)
Trichophyton rubrum	22 (8.70%)	29 (11.46%)	51 (20.16%)
Microsporum audonii	7 (2.77%)	10 (3.95%)	17 (6.72%)
Microsporum gypseum	3 (1.19%)	4 (1.58%)	7 (2.77%)
Epidermophyton floccosum	-	2 (0.79%)	2 (0.79%)
Trichophyton tonsurans	-	2 (0.79%)	2 (0.79%)
Total	111 (43.87%)	142 (56.13%)	253 (100.0%)

Table 1: Distribution of the isolated fungi according to gender.

The trunk 112 (44.30%) was the most affected site, followed by nail 56 (22.13%) and hair 44 (17.40%) with the least affected being the hand 4(1.60%) (Table 2).

Trunk (%)	Hair/scalp (%)	Nail (%)	Feet/intergital Space (%)	Hand (%)	Groin (%)	Face (%)	Total (%)
1 (0.40%)	4 (1.58%)	-		-	-	-	5 (1.98%)
6 (2.37%)	17 (6.72%)	1 (0.40%)	-	-	-	-	24 (9.49%)
18 (7.11%)	7 (2.77%)	1 (0.40%)	1 (0.40%)	1 (0.40%)	-	-	28 (11.07%)
27(10.67%)	5 (1.98%)	14 (5.53%)	1 (0.40%)	-	-	-	48 (18.97%)
34 (13.44%)	5 (1.98%)	16 (6.32%)	7 (2.77%)	-	-	4(1.58%)	66 (26.09%)
16 (6.32%)	2 (0.79%)	12 (4.74%)	5 (1.98%)	1(0.40%)	1(0.40%)	-	37 (14.62%)
4 (1.58%)	1 (0.40%)	6 (2.37%)	5 (1.98%)	-	3(1.19%)	1(0.40%)	20 (7.91%)
6 (2.37%)	3 (1.19%)	6 (2.37%)	2 (0.79%)	2(0.79%)	4(1.58%)	2(0.79%)	25 (9.88%)
111 (43.87%)	44 (17.39%)	56 (22.13%)	21	4 (1.58%)	9 (3.56%)	7 (2.77%)	253 (100.0%)
			-8.30%				

Table 2: Distribution of the site of infection according to age groups.

Discussion

Superficial mycosis is rarely life threatening but can cause debilitating effects on a person's quality of life, or become invasive in immuno-compromised individuals. The present study showed female preponderance, correlating with the study that was done 15 years ago on dermatophytes, in the same institution by Ozumba and Nlemadim in 2005 [17]. Many other studies have also reported a higher rate of superficial mycosis in female patients [18,19]. Females are known to visit health care services more frequently than males. Additionally, there is reduction in triacylglycerides that is found in sebum of the postmenopausal women [20]. This finding is contrary to the studies done by Hazarika et al. [8] and Bhavsar et al. [21].

Patients in age group 35-44 years were seen to be mostly affected in the study followed by 25-34 years age brackets. This is in concordance with studies done by Dulla et al. [18], and Vasudha et al. [22], who reported higher rates in age-groups 31-40 years and 35-45 years respectively. This may probably be due to increase exposure, physical activities and hormonal changes seen in these age groups [23].

Dermatophytes were the commonest fungi isolated from the superficial fungi infection. This is in consistent with several works that have been reported in different locations [8,13]. *Trichophyton soudanense* (56%) was the predominate dermatophytes causing superficial mycosis in the present study, followed by *Trichophyton rubrum* (51%). These findings were against the previous work done on dermatophytes some years ago in Enugu, which reported *T. soudanense* and *T. metagrophytes* as the commonest agents of superficial mycosis. *T. soudanense* is an anthropophilic fungi and based on the literature, is common in Africa and west Asia [24,25]. Bréchard et al. [13] in Senegal, also reported high rate of *T. soudanense* in their work. Nevertheless, some previous studies done in Africa reported Trichopyton soudanense as rare causes of superficial mycosis [16,21,26].

Among the non-dermatopytes, the commonest isolate was *Cladosporium* Species (48%) *Cladosporium* is a dematiaceous fungus which mostly causes localized superficial or deep lesions [27,28]. The isolation of high rate of *Cladosporium* Species (48%) is noteworthy. Although they are among the most common fungal inhabitants worldwide, several researchers reported them as rare causes of superficial mycoses. Low rate (24.9%) has been reported in a study done in Senegal.

The change in trend of the causative agents may be attributed to the injudicious use of triple action topical antifungal drug that contains corticosteroid, antifungal and antibacterial. They are widely available, sold over the counter in Nigeria, with patients abusing the drug even physicians commonly prescribe the drug because of its triple action [29]. Also, many people currently use cosmetic products that contain topical corticosteroid [30]. Prolonged corticosteroid usage may decrease local immunity, thereby increasing the severity of infection, lead to steroid-modified fungal infection, and development of resistant strains [31-33].

The commonest site of infection reported in the present study was the trunk which is in corroboration with other studies [32,33].

Superficial fungal infection of the scalp was seen more in children less than 14 years particularly in males. This is in agreement with studies done by Bennassar et al. [34] and Sudha et al. [35] in which they reported that tinea capitis as disease of children. Poor hygiene, frequent contacts with affected children, use of contaminated clippers was some of the risk factors that predispose them to fungal infections of the scalp [36]. Furthermore, in adults, during puberty there is a change in hormones which results in acidic sebaceous gland secretions with decrease in fungi infection [35].

Conclusion

The result of this study has shown that the epidemiology of superficial mycoses has changed over the years. The high rate of previously rare fungi reported in earlier studies, highlights the need for continuous surveillance of fungal infections. Accurate diagnosis with isolation, identification and sensitivity testing will help in proper and effective management of the patient.

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