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Rate of Tinea Pedis infection in a population of patients with diabetes mellitus

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ABSTRACT

BACKGROUND: Tinea pedis is a common superficial fungal infection caused by dermatophytes. It has a prevalence of about 10% in the general population. The species of dermatophyte implicated include Trichophyton, Microsporun and Epidermophyton with Trichophyton rubrum being responsible for most infections.

AIM: To determine the prevalence of Tinea pedis and dermatophyte species implicated in a population of diabetic patients attending an outpatient clinic.

METHOD: Six hundred and ninety five diabetic patients attending the outpatient clinic of Obafemi Awolowo University Teaching Hospital Complex were examined for evidence of fungal infection of the feet. Skin scrappings were collected from those with clinical

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fungal infection and immediately sent to the laboratory for fungal studies. Microscopy and culture was done for confirmation of diagnosis and speciation.
RESULTS: One hundred (14.4%) of the participants had clinical Tinea pedis. Eleven (11%) of the specimens collected showed no fungal growth after four weeks inoculation to Sabouraud's Dextrose Agar (SDA). Trichophyton species were present in Seventy three (82.02%) of the growths/isolates while ten (11.24%) had Microsporum and six (6.74%) Epidermophyton species.
CONCLUSION: Since sizeable population of diabetics do have Tinea pedis infection, Physicians caring for them, should remember that it may result in complications like the formation of foot ulcers through the development of fissures in the plantar and/or interdigital skin.

Key Words: Diabetes, Sabouraud's Dextrose Agar (SDA), Dermatophyte infection, Culture

1. INTRODUCTION

Dermatophytes cause superficial fungal infection due to their ability to attach to keratin. They colonize keratinized tissues like stratum corneum of the epidermis, hair and nails which provide them with nutrients. Such superficial fungal infections by dermatophytes are termed dermatophytosis.

Tinea pedis describes dermatophyte infection of soles of the feet and the interdigital spaces. It was first described by Pellizzari in 1888.[1] Whitefield and Sabouraud first reported Tinea pedis in 1908 and thought it was caused by the same organism that is implicated in Tinea capitis.[2] Trichophton rubrum, Trichophyton mentagrophytes and Epidermophyton floccosum are the most commonly implicated species of dermatophyte causing Tinea pedis.[3] Though the recent pattern has been evolving over time, before the second world war, in Europe, Microsporum audouinii and Epidermophyton floccosum held the first position, however since the 1950's, Trichophyton rubrum is the most frequently isolated dermatophyte accounting for up to 80-90% of the strain.[4] This development is typical for North and Central Europe and is connected with a rise in the incidence of Tinea pedis.[4]

The prevalence of Tinea pedis is approximately 10% and is driven by occlusive foot wears, communal baths, showers and pools. Host variability could affect presentation. Immunocompromised individuals are susceptible to severe or refactory dermatophytosis including Tinea pedis.[5] Tinea pedis is prevalent among patients with Diabetes Mellitus and is a cause of Diabetic foot. Attachment and penetration of the keratin by the organism can cause a gap in the cutaneous barrier that could predispose to bacteria infection.

This study is aimed at establishing the prevalence of Tinea pedis in diabetic population and also to identify the species commonly implicated in our environment. This becomes necessary because most studies in this direction was predominantly carried out in the general population and not the diabetic subset.

2. METHODS

The study involved six hundred and ninety five participants that were attending the Diabetic clinic of Medical Outpatient department, Obafemi Awolowo University Teaching Hospitals Complex Ile Ife Nigeria. The patients were confirmed to be diabetic (type 1 or 2) by the consultant endocrinologist and recruited consecutively over a period of six weeks.

Specific lower limb examination was carried out to determine the presence or absence of Tinea pedis. Scrapping was done for only participants with clinical diagnosis of Tinea pedis. Scrapping of the lesion was done using the dull edge a size 15 surgical blade once Tinea pedis was present. Scrapping was done from the advancing margins of the lesion and material scrapped was wrapped with a clean dry white paper then transported to the laboratory. In the laboratory, the scrapings were placed in a microscopic slide containing 10% potassium hydroxide (KOH), covered with a cover slip and slightly warmed. The slides were viewed under low power microscopy then observed for the presence of septate and branching hyphae without constriction usually associated with dermatophyte infections.

Samples of the scrapings were also cultured at room temperature using Sabouraud's dextrose agar (SDA) to speciate the dermatophyte into Trichophton, Epidermophyton and Microsporum. The specimens on SDA culture medium were incubated at 35-37^{o}C aerobically. The cultures were incubated for up to four weeks and those with no growth discarded. Dermatophyte species were identified based on colony appearance of the culture. Mycelial growth was examined microscopically for specialized hyphae such as spiral, pectinate or antier hyphae. Presence/absence and morphology of macroconidia, microconidia, and chlamydosphores was also noted. Specimen collection was not repeated for any negative result was noted.

Permission for the study was granted by the Research and Ethics Committee of Obafemi Awolowo University Teaching Hospitals Complex Ile Ife Nigeria. Data was analysed using SPSS version 20 while results were presented using descriptive statistics and charts.

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3. RESULTS

Table 1 Clinical information

	N (%)
Clinical diagnosis of Tinea pedis (N=695)	
Present	100 (14.4)
Absent	595 (85.6)
Gender (N=100)	
Male	52 (52)
Female	48 (48)

Figure 1 Outcome after 4 weeks inoculation of SDA

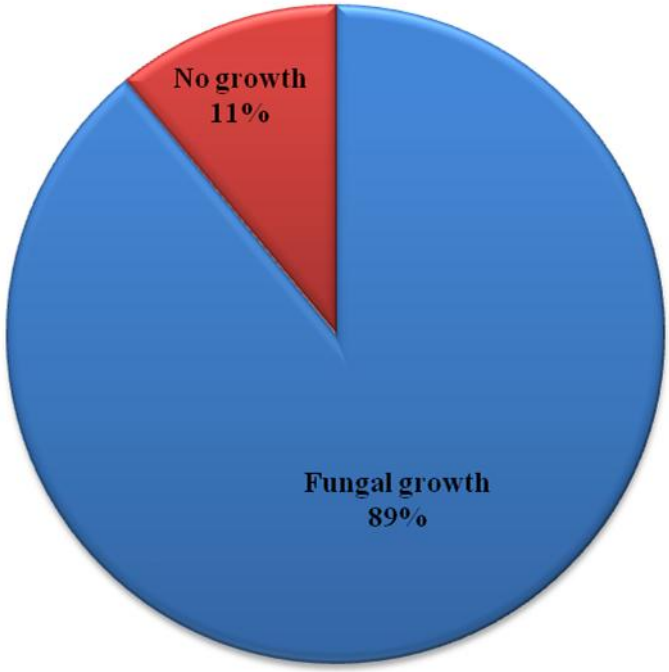

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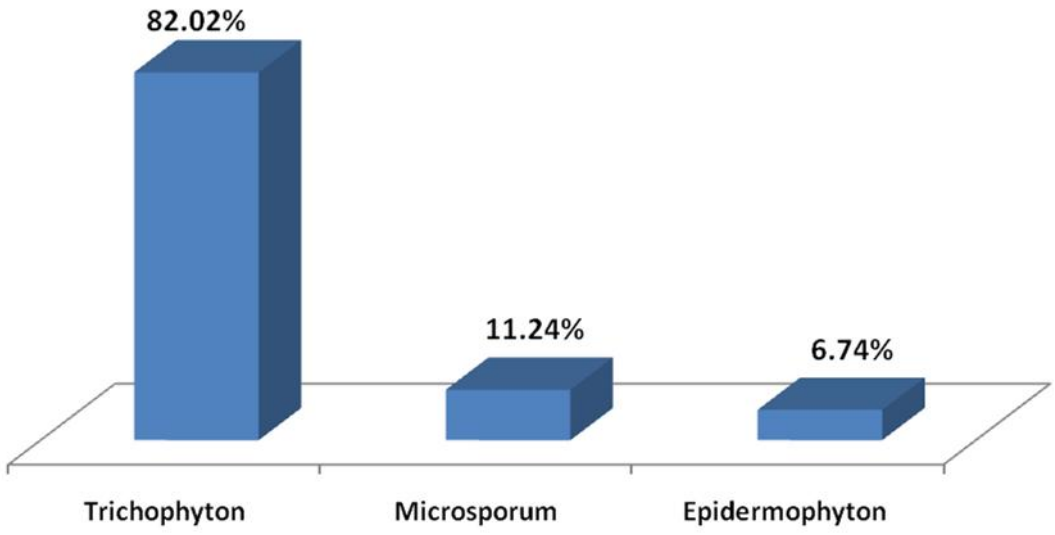
Table 2 Outcome of Sabouraud's dextrose agar (SDA) culture

	N (%)
Outcome after 4 weeks inoculation (N=100)	
Fungal growth	89 (89)
No growth	11 (11)
Dermatophyte specie present in culture (N=89)	
Trichophyton	73 (82.02)
Microsporum	10 (11.24)
Epidermophyton	6 (6.74)

Figure 2 Dermatophyte specie present in SDA culture



4. DISCUSSIONS

A total of Six hundred and ninety five Diabetic patients had their feet examined. One hundred of the participants were clinically diagnosed to have Tinea pedis. There were 52 males and 48 females, with a male female ratio of 1.08:1. Microscopy showed presence of septate and branching hyphae confirming dermatophyte infection in all the samples.

Culture with SDA over four weeks showed that the majority of the culture media were positive for Trichophyton specie which represented seventy three (82.02%) of the total cultured specimen, Microsporum (11.24%) and Epidermophyton (6.74%). Eleven (11%) of the medium did not grow any organism. Dermatophyte infection of the feet (Tinea pedis) is a very common fungal infection

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which increasingly occur among individuals who walk bare footed, wear tight fitting foot wears and indulge in communal baths such as share of showers and pools.[6,7] Tinea pedis is the most common dermatophyte infection worldwide with a prevalence of up to 10%.[8]

The prevalence of 14.4% seen in this study is slightly higher than that in the general population. This could probably be explained by the fact that this study was conducted among a sub-set of the general population i.e. those with diabetes mellitus. Studies are not conclusive on the susceptibility of Tinea pedis among patients with diabetes mellitus. Some studies concluded that diabetes mellitus may be associated with increasing prevalence to Tinea pedis, other refute that and suggested no change in prevalence among the diabetic population when compared to their non diabetic counterparts.[9,10]

However diabetes mellitus is generally known to affect the course of established infections.[11] Cellular immunity is known to be impaired in individual with diabetes mellitus especially the type IV or delayed type hypersensitivity reaction.[12] This aspect of the immunity plays a pivotal role in combating dermatophytosis.[12] It is therefore not surprising that individuals with diabetes mellitus could be more susceptible to dermatophyte infections especially Tinea pedis leading to a higher prevalence as documented in this study. This impaired cellular immunity may also be an explanation for the protracted course of the infection and more extensive involvement noticed in patients who suffer from diabetes mellitus.

Tinea pedis may also be problematic in a population of patients with diabetes mellitus because such infection in a patient with hyperglycaemia and peripheral vascular changes common in diabetes may take long to heal and secondary bacteria infection could complicate the whole picture.[13] All these could lead to diabetic foot disease which if not properly handled may lead to a non healing foot ulceration with attendant risk of limb amputation.

Majority of the culture specimen showed the growth of Trichopyton specie making this group of organisms the most common cause of Tinea pedis in this study. The specie was responsible in up to 82.02% of the patients studied. Though Trichophton rubrum the most commonly implicated cause was initially endemic in small regions of Southeast Asia, parts of Africa and Australia, it is now the most prevalent dermatophyte worldwide due to increasing mass movements across the continents resulting from general increase in available means of travel and rise in the use of occlusive foot wears.[14] In a study evaluating the dynamics of dermatophytosis frequency in Mexico, trichopyton remain the most implicated specie accounting for 83.3% of the total number of infection from dermatophytosis with T. rubrum constituting 71.2%.[14] Muhammed Al Hassan et al also found Trichophyton to be the most dominant dermatophyte in their study on Tinea pedis and its complications.[15]

Microsporum and Epidermophyton were identified in 11.24% and 6.74% of the culture specimens in this study. In other studies Microsporum was seen in 4.5% and1.1% while Epidermophyton was seen in 1.3% and 0.7% of culture specimens of patients with Tinea pedis.[14, 16] In most studies the shift in dermatophyte causation of Tinea pedis is predominatly towards Trichophyton as the commonest cause and then Microsporum and Epidermophyton in decreasing order.

This consistency is also found in a population of patients with diabetes mellitus where Tichophyton, Microsporum and Epidermophyton were also encountered in decreasing order of prevalence as the causative species as demonstrated in this study. Tinea pedis is not found to be predominant in diabetic population and the species of dermatophyte causing it, not different from the general population. The course may however be more prolonged and complications commoner because of co-morbidities associated with diabetes mellitus.

5. CONCLUSIONS

Tinea pedis is a common dermatophyte infection both in the general population and among diabetics. The most common of the implicated dermatophytes causing Tinea pedis being Trichophyton. Physicians involved in their management/treatment should remember that it may result in complications like the formation of foot ulcers through the development of fissures in the plantar and/or interdigital skin.

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