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AETIOLOGIC AGENTS OF *TINEA PEDIS* AMONG DIABETICS AND NON DIABETICS IN CALABAR NIGERIA

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ABSTRACT

A total of 30 diabetic and 36 non- diabetic controls aged between 20-79 years were examined for *tinea pedis* using standard microscopic and cultural procedures. The prevalence rates of *tinea pedis* were 8 (26.7%) and 4 (11.1%) among diabetics and non-diabetics respectively. *Trichophyton mentagrophytes var interdigitale* was the most prevalent fungal species isolated in this study. *Candida albicans* was isolated from only diabetic subjects that had symptoms of *tinea pedis*. This suggests that diabetes mellitus may be a risk factor for *tinea pedis* caused by *Candida albicans*.There was a higher infection rate in diabetics aged between 40-79 years of age when compared with non- diabetic controls, where *tinea pedis* was only found among the younger age groups range. There was a significant difference in the infection rates among male and female diabetic subjects ($p < 0.05$) It is concluded that diabetes mellitus may be a predisposing factor to *tinea pedis* caused by *Candida albicans* but not by dermatophytes.

Key words: Aetiology, Diabetics mellitus, Dermatophytes, *Tinea pedis*.

INTRODUCTION

Tinea pedis is a fungal infection of the feet, which particularly involves the toe webs and soles. In most instances, the site of initial infection is the fourth space[1] but the fifth space may also be affected. *Trichophyton rubrum* and *T. mentagrophytes* followed by *Epidermophyton flocossum* have been reported as agents isolated from *tinea pedis*[2].

The toe webs like the rest of the skin are normally colonised by a variety of micro- organisms, but *Dermatophytes* are not considered part of the normal skin flora[3]. Diabetic patients are often susceptible to opportunistic bacterial and fungal infections due to either their relatively immuno-compromised state[4] or to biochemical abnormalities inherent in the diabetic state. Anogenital candidiasis, oral thrush and candidal infection of the skin, especially the moist parts frequently occur in diabetic patients[5].

The aim of this study was to identify the mycotic agents causing *tinea pedis* among diabetics in Calabar, Nigeria and also attempt to re-affirm if Diabetes mellitus is a predisposing factor for *tinea pedis*.

MATERIALS AND METHODS

Thirty diabetic patients who were registered in the diabetic clinic at the University of Calabar Teaching Hospital between January and June 2000 were selected for the study irrespective of the duration of their diabetes. Control subjects used in this study were 36 randomly selected persons who matched the diabetics in sex and age, all of them living in Calabar metropolis.

Sample Collection

The toe-webs of each person registered for the

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TABLE 1: PREVALENCE OF TINEA PEDIS AMONG 30 DIABETIC PERSONS AND 36 NON-DIABETIC CONTROLS

FINDINGS	NO (%) PRESENT AMONG;		
	DIABETIC SUBJECTS n = 30	NON-DIABETIC CONTROLS n = 36	TOTAL n = 66
Clinical Lessions	7(23.3)	5(13.8)	12(18.2)
Infection with dermatophytes	5(16.7)	4(11.1)	9(13.6)
Infection with Candida albicans	3(10.0)	0(0.0)	3(4.5)

TABLE 2: AETIOLIGIC MYCOTIC AGENTS CAUSING TINEA PEDIS IN CALABAR

FUNGAL ISOLATES	NO (%) ISOLATED FROM DIABETICS		NO (%) ISOLATED FROM NON-DIABETIC		TOTAL NO (%) ISOLATED
	MALE	FEMALE	MALE	FEMALE	
T. mentagrophytes var interdigitale	-	1	2	1	4(33.3)
Trichophyton verrucosum	-	2	-	1	3(25.0)
Trichophyton violaceum	-	1			1(8.3)
Trichophyton flocossum	-	1			1(8.3)
Candida albicans	1	2			3(25.0)
Total	1(7.1%)	7(42.8%)	2(11.1%)	2(11.1%)	12(100.0)
Probability x 2	(P<0.05)		(P>0.1)		

study, were examined physically for clinical abnormalities particularly those suggestive of fungal infections. The symptoms sought for included scaling, maceration, discoloration and versiculation. The toe-webs were cleaned with 70% alcohol soaked cotton wool swabs and allowed to dry. Skin scraping was then taken from the fourth and fifth toe-webs bilaterally regardless of the presence or absence of gross lesions using sterile scapel blades. Scrapings were taken from lesions observed on any other toe-webs. The scrapings were put in pre-sterilised envelopes to reduce contamination and humidity.

Mycological Procedures.

A portion of the skin scraping was placed on a clean grease free glass slide. A drop of 20% KOH was added to the sample and a cover slip placed over it. The preparation was allowed to digest for 20-30 minutes at 37°C. The KOH was replaced with lacto- phenol cotton blue and the preparation examined microscopically using the x10 and x40 objectives to detect the presence of fungal hyphae and arthrospores.

A portion of each specimen was inoculated into a plate of Sabouraud Dextrose agar (Oxoid) with 500mg/l chloramphenicol to inhibit bacterial growth. The plates were incubated at room temperature for 14 days before being discarded as negative. Fungal growths were identified according to their colonial morphology on Sabouraud agar, nature of growth, pigmentation,

presence and type of hyphae, conidia and sporangial arrangements using a standard identification scheme[6].

RESULTS

Out of the 30 diabetic subjects examined, 7(23.3%) had clinical lesions while 5(16.7%) and 3(10%) were infected with *Dermatophytes* and *Candida albicans* respectively as presented in Table 1. Among the 36 matched controls, 5(13.8%) had clinical lesions. In this group, 4(11%) were infected with *Dermatophytes* while none was infected with *Candida albicans*. Specimens from all the subjects with clinical lesions yielded fungal growth when cultured.

The most prevalent fungi encountered were *Trychophyton mentagrophytes* var *interdigitale* (33%) followed by *T. verrucosum* and *Epidermophyton floccosum* with a prevalence rate of 8% each. Among the 16 female diabetic subjects studied, 7(43%) were infected while 1 out of the 14(7.1%) male diabetics was infected (Table 2). The non-diabetic controls did not show any sex variation in the rate of infection as 2 out of 18 (11.1%) were infected from both sexes.

The association of clinical lesions with actual fungal infections among the subjects studied is shown in Table 3. All the toe-webs with macerations/ sogginess and odoriferous exudates were infected with various fungal species. Eighty percent of the lesions with versicular eruptions were infected with *Dermatophytes* while 20% were infected with *Candida albicans*. Lesions manifesting with scaling were less frequently associated with fungal infections. Lesions with

TABLE 3: ASSOCIATION OF CLINICAL LESIONS WITH INFECTIONS

CLINICAL LESIONS	NO OF SUBJECTS WITH EACH LESION TYPE	NO (%) POSITIVE FOR DERMATOPHYTES	NO (%) POSITIVE FOR CANDIDA ALBICANS
Scaling	3	1(33.3)	0(0.0)
Maceration and Sogginess	2	2(100.0)	0(0.0)
Vessicular Eruptions	5	4(80.0)	1(20.0)
Lesions with odoriferous exudates	2	2(100.0)	2(100.0)

TABLE 4: DISTRIBUTION OF TINEA PEDIS ACCORDING TO AGES OF SUBJECTS INFECTED

AGE GROUP (IN YEARS)	NO EXAMINED	NO (%) INFECTED AMONG		TOTAL NO (%) INFECTED
		DIABETICS 30	NON-DIABETICS 36	
Below 20	-	-	-	-
20 - 29	23	-	3	3(25.0)
30 - 29	15	-	1	1(8.3)
40 - 49	11	3	0	3(25.0)
50 - 59	9	3	-	3(25.0)
60 - 69	5	3	-	2(16%)
70 - 79	3	2	-	-
Total	**66**	**8(26.7)**	**4(11.1)**	**12(100.0)**

odoriferous exudates were characterised by multiple infections with *Dermatophytes* and *Candida albicans*.

The distribution of *tinea pedis* among the age groups of subjects studied is shown in Table 4. *Tinea pedis* was found only n diabetics aged from 40 and above, while in the non- diabetic controls. infection of the toe-webs was seen among subjects between 20 and 39 years of age

DISCUSSION

Tinea pedis is a nagging health problem especially among people living in the warm tropical parts of the world[1]. In Nigeria, *tinea pedis* popularly referred to as "athlete's foot" has a wide distribution in the warmer and wet southern parts particularly among athletes who share common facilities[7]. In this study, 16.7% and 11.1% prevalence rates of *tinea pedis* were observed among diabetics and non-diabetic controls respectively. This shows a comparable infection rate ($p>0.1$). This finding is in agreement with the reports of Feldman and Prins[8], who concluded that diabetes was not a predisposing factor for *tinea pedis* caused by *Dermatophytes*. However, a statistically significant difference was observed when the infection rate of toe-webs by *Candida albicans* was compared between diabetics and non-diabetic controls ($P<0.01$). This observation is in agreement with previous reports[9,10].

The diabetic subjects whose toe webs were infected were all above 40 years of age. This shows that *tinea pedis* among the diabetics was associated with older patients, most of whom were insulin dependent. This agrees with the report of Kemmely[11].

Trichophyton mentagrophytes var *interdigitale* was the most frequently isolated fungal species in this study, which is in agreement with the reports of Egere and Gugnani[7]. *Candida albicans* was isolated from diabetic patients only. This suggests a relationship between *tinea pedis* caused by *Candida albicans* and the diabetic state. This may be attributed to incraesed blood sugar in diabetics, which favours proliferation of *Candida albicans*[12]

This study has shown that, majority of the cases of *tinea pedis* among diabetics, were caused by Dermatophytes and that diabetes mellitus may be a risk factor for *tinea pedis* caused by *Candida albicans*. Larger studies possibly multicentre, are needed to further validate these findings.

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