ARTICLES

Tinea pedis among diabetics in Basrah: prevalence and predictors

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[**Abstract**] **Objective** Tinea pedis is a chronic fungal infection of the feet, very often observed in patients who are immuno-suppressed or have type 2 diabetes mellitus (DM). The aims of the present study are to determine the prevalence of type 2 DM in the adult population with tinea pedis as well as the presence of tinea pedis, for detecting new of type 2 DM. **Methods** A cross sectional study of patients attending the diabetes center in Al-Faiha Hospital in Basrah. Any patients found to have tinea pedis, during the period from January 2004 to end of December 2006, were enrolled in this study. Diagnosis of tinea pedis is based on history and clinical appearance of the feet in addition to direct microscopy of a potassium hydroxide (KOH) preparation for fungal hyphae. **Results** The total number of patients with tinea pedis in this study was 629. The prevalence rate of diabetes among the patients with tinea pedis was 24.8%. 58 (9.2%) patients with tinea pedis were discovered to have new diabetes for the first time after screening. Variables found in patients with tinea pedis, associated with diabetes was only, age >50 (OR, 0.4; 95% CI, 0.2 to 0.6; $P = 0.0001$) and rural residency (OR, 1.6; 95% CI, 1.1 to 2.4; $P = 0.01$). **Conclusion** Tinea pedis is not uncommon among diabetics, and any new patients with tinea pedis seen should be investigated for diabetes.

[**Key words**] diabetes mellitus; fungal infection; tinea pedis; Iraq

INTRODUCTION

Superficial mycoses are considered to affect more frequently patients with type 2 diabetes mellitus (DM), especially onychomycosis and tinea pedis.

Tinea pedis is a chronic fungal infection of the feet, very often observed in patients who are immuno-suppressed or have diabetes mellitus. Three main genera of fungi may cause tinea pedis: *Trichophyton*, *Epidermophyton*, and *Microsporum*. Other, nondermatophtye, fungi such as *Malassezia furfur*, *corynebacterium minutissimum*, and *Candida* species may also cause tinea pedis[1].

Tinea pedis is estimated to be the second most common skin disease in the United States, behind acne[2,3]. Across Europe and East Asia prevalence rates reach 20%[4]. Three variants of tinea pedis have been described: interdigital type, moccasin type, and vesiculobullous type[5]. Interdigital tinea pedis is the most common form and usually manifests in the interspace of the fourth and fifth digits and may spread to the underside of the toes[1]. Other interdigital inflammatory conditions need to be included in the differential diagnosis and include erythrasma, impetigo, pitted keratolysis, *Candida intertrigo*, and *Pseudomonus aeruginosa* interdigital infection[6].

Paradoxically tinea pedis was associated with a lower risk of foot ulcer, because tinea pedis needs an intact autonomic nervous system to causes sweating and, warmth, which are the predisposing factors[7].

The aims of the present study were to determine the prevalence of type 2 DM in the adult population with tinea pedis as well as the presence of tinea pedis, for detecting new of type 2 DM.

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MATERIAL AND METHODS

A cross sectional study of patients attending the diabetes center in Al-Faiha Hospital in Basrah. This center receives patients with established diabetes and those want to be screened for it. Any patients found to have tinea pedis, during the period from January 2004 to end of December 2006, were enrolled in this study. Type 2 DM was diagnosed according to the American Diabetes Association's (ADA) of fasting plasma glucose value ≥ 126 mg/dl (7.0 mmol/L) on two occasion or symptoms of diabetes and a casual plasma glucose ≥ 200 mg/dl (11.1 mmol/L) or established disease on therapy[8].

Only interdigital tinea pedis was considered because it is the most common form and has less differential diagnosis than other types[1]. Diagnosis of tinea pedis is based on history and clinical appearance of the feet in addition to direct microscopy of a potassium hydroxide (KOH) preparation for fungal hyphae. Fungal culture and Wood's lamp were not done.

Patients who were widow, separated, single, or divorced were considered as unmarried. According to the qualifications (years of school achievement), patients were divided into two groups (6 years of school achievement and less and those above). Standing height and weight measurements were completed with subjects wearing light-weight clothing and no shoes. Height was measured to the nearest cm and weight was measured to the nearest half kilogram (kg). BMI was calculated as body weight in kilograms divided by the squared value of body height in meters (kg/m^2). Subjects reporting smoking at least one cigarette per day during the year before the examination were classified as smokers.

STATISTICAL ANALYSIS

The prevalence of tinea pedis was calculated by dividing the number of subjects with the disorder by the total number of subjects. Continuous variables were analyzed using unpaired *t*-tests. The relevance of potential risk factors was analyzed by univariate (Chi-square) and multivariate logistic regression analyses. A *P* value less than 0.05 was considered statistically significant.

RESULTS

Total number of patients with tinea pedis in this study was 629. Men constituted 43.7% and women 56.2% (Table 1) with mean age of 50.3 ± 13.9 years. The disease was bilateral in 54.3%; the 4th web space alone affected in 71.2%, and both 4th and 3rd webs in 21.4%. Only 20 patients (3.1%) were aware of the tinea pedis and the others thought that these white macerate web lesions were benign and used herbal remedies to treat them. Of those who were diabetics none thought that it was related to diabetes.

Table 1 Characteristics of 629 Patients with Tinae Pedis

Item	No. (%)
Sex	
Male	275(43.7)
Females	354(56.2)
Known case of diabetes	156(24.8)
New diabetes	58(9.2%)
Unilateral	287(45.6)
Bilateral	342(54.3)
*4th web	448(71.2)
4th and 3rd webs	135(21.4)
3rd web	30(4.7)
Second web	2(0.3)
First web	1(0.1)
Total	629(100)

* some have more than one sit

The prevalence rate of diabetes among patients with tinea pedis was 24.8%. 58 (9.2%) of patients with tinea pedis, were discovered to have new diabetes after screening.

Variables found in patients with tinea pedis, associated with diabetes were only, age > 50 (OR, 0.4; 95% CI, 0.2 to 0.6; $P = 0.0001$) and rural residency (OR, 1.6; 95% CI, 1.1 to 2.4; $P = 0.01$) in the

univariate analysis(Table 2). In the multivariate analysis(Table 3), both remained an independent risk factor for diabetes in patients with tinea pedis. No association was found between genders, marital status, occupation, qualification levels, BMI, or smoking state and diabetes.

Table 2 Univariate Association of Demographic Data of Patients with Tinea Pedis Presenting to the Diabetic Clinic

Variable		Total No. (%)	Diabetic No. (%)	Non-diabetic No. (%)	Odd ratio	95% CI	*P*
Age(years) (Mean ± SD)		50.3 ± 13.9	54.8 ± 12.1	48.8 ± 14.2			0.0001
Age(years)	≤ 50	288(45.7)	48(16.6)	240(83.3)	0.4	0.2 ~ 0.6	0.0001
	>50	341(54.2)	108(31.6)	233(68.3)			
Sex	Men	275(43.7)	69(25.0)	206(74.9)	1.0	0.7 ~ 1.4	0.9
	Women	354(56.2)	87(24.5)	275(75.4)			
Marital status	Married	511(81.2)	121(23.6)	390(76.3)	0.7	0.4 ~ 1.1	0.1
	Unmarried	118(18.7)	35(29.6)	83(70.3)			
Occupation	Employed	111(17.6)	24(21.6)	87 (78.3)	0.8	0.4 ~ 1.3	0.4
	Unemployed	518(82.3)	132(25.4)	386(74.5)			
Qualification(Mean ± SD)		5.0 ± 5.7	4.6 ± 5.7	5.1 ± 5.7			0.2
Qualification (years)	≤6	225(35.7)	108(26.7)	296(73.2)	1.3	0.9 ~ 1.9	0.1
	>6	404(64.2)	48(21.3)	177(78.6)			
BMI(Mean ± SD)		29.8 ± 5.8	30.3 ± 5.4	29.6 ± 6.0			0.1
BMI	(<30)	332(52.7)	78(23.49)	254(76.5)	0.8	0.6 ~ 1.2	0.45
	(≥30)	297(47.2)	78(26.2)	219 (73.7)			
Residency	Urban	395(62.7)	111(28.1)	284 (71.8)	1.6	1.1 ~ 2.4	0.01
	Rural	234(37.2)	45 (19.2)	189(80.7)			
Smoker	yes	118(18.7)	27(22.8)	91(77.1)	0.8	0.5 ~ 1.4	0.6
	No	511(81.2)	129(25.2)	382(74.7)			

Table 3 Multivariate Association of Demographic Data of Patients with Tinea Pedis Presenting to the Diabetic Clinic

Variable		Diabetic No. (%)	Non diabetic No. (%)	Odd ratio	95% CI	*P*
Age	≤ 50	48(16.6)	240(83.3)	-0.14	0.29 ~ 0.64	0.0000
	>50	108(31.6)	233(68.3)			
Residency	Urban	11(28.1)	284 (71.8)	0.06	1.07 ~2.37	0.0000
	Rural	45 (19.2)	189(80.7)			

DISCUSSION

More women had tinea pedis in this study (56.2% versus 43.7%) with mean age of 50.3 ±13.9 years. This seems different from other studies, where men between 20 and 40 years of age are most frequently affected[4,9,10].

The prevalence rate of tinea pedis among our patients with diabetes was 24.8%. A similar prevalence is seen in Croatia[11], while Gil Yosipovitch, *et al.* reported 32% tinea pedis among diabetics[12].

The problem of our study sample was the unawareness of our people about web lesions. Only 20% had noticed abnormalities in the web spaces. Even those who noticed theses changes, they could not link them to diabetes. The prevalence of occult tinea pedis in Japan is 25%[4].

Of those found to have tinea pedis in this study, 9.2% turned out to have diabetes, once they were screened for diabetes. The message from this, is that tinea pedis, may be a marker for diabetes, and any patients discovered to have tinea pedis, should be screened for diabetes.

Variables found in patients with tinea pedis, associated with diabetes was only, age >50 and rural residency in this study. Only gender was predictive for the occurrence of tinea pedis in one study on the general population in Spain[10], while in other study only type 2 DM versus type 1 was more associated with tinea pedis but no association was found with gender, age, or duration of diabetes[11].

The prevalence rate of tinea pedis among patients with type 2 diabetes was 24.8%. That has tinea pedis, 9% turn to have new diabetes. The awareness of our patients regarding web lesions was poor. Variable found in patients with tinea pedis, associated with diabetes, was only age >50 and rural residency. Tinea pedis is not uncommon among diabetics, and any new patients with tinea pedis seen should be investigated for diabetes.

No culture was done, so we could not know the type of fungi and cases associated with mixed infection with bacteria also were missed. Wood's lamp was not done, so we may missed some infection with *Malassezia furfur* and *Corynebacterium Minutissimum*[2,6].

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