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Dermatophytosis in special patient populations

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ABSTRACT

Objective: To study the occurrence and prevalence of dermatomycosis in special patient populations suffering from diabetes, cancer and heart diseases.

Methods: A total of 640 patients suffering from diabetes, 280 patients suffering from cancer and 210 patients suffering from heart diseases from Cairo City were evaluated for dermatophytosis at the dermatology clinics of four different hospitals from January 2005 to December 2006.

Results: The presence of diabetes looks a risk factor for tinea pedis and tinea corporis. Tinea cruris and tinea unguium were not common among diabetics, while tinea capitis and tinea versicolor were completely missed. Tinea capitis followed by tinea pedis are the most common among cancer patients. Thirty cases were recorded for tinea among 210 patients with heart diseases of which tinea capitis and tinea versicolor were recorded once while the other clinical types of tinea were estimated in 6-8 patients for each type.

Conclusions: The present investigation shows that diabetes remains to be a risk factor for dermatophytosis and cancer comes next due to the use of radioactive irradiation.

1. Introduction

Dermatophytes are a group of closely related keratinophilic fungi that infect keratinized tissues such as hair, nails and skin. The disease caused by dermatophytes is known as dermatophytosis which constitutes an important public health problem, not only in underdeveloped countries but also in elderly and immuno-compromised patients worldwide[1].

The etiologic agents of the dermatophytosis can be categorized into three genera: *Epidermophyton*, *Microsporum* and *Trichophyton*. They possess keratinophilic and keratinolytic properties[2,3].

Traditionally, infections caused by dermatophytes (ringworm) have been named by appending the latin name of the affected body part after the word "tinea" as tinea capitis (ringworm of the scalp), the most common fungal infection in children, tinea barbae, an infection of the bearded area in the adult males, tinea corporis, involving the trunk, limbs, and occasionally the face, tinea cruris, infection of the groin, perianal, and perineal areas and usually occurring predominantly in adolescent, young adult men and in post-pubertal females, tinea versicolor, superficial fungal infection of the skin produced by *Malassezia*, tinea imbricate, chronic infection which is a specialized manifestation of tinea corporis, tinea manuum diffusing dry scaling lesions with accentuation of the flexural creases of the palms of the hands, tinea pedis originating in the interdigital clefts, soles, dorsum and occasionally the ankles, leg and tinea unguium (onychomycosis), fungal infection of the nail[1].

The aim of this investigation was to study the occurrence and prevalence of dermatophytes causing human dermatomycosis in special patient populations suffering from diabetes, cancer and heart diseases.

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The study protocol was performed according to the Helsinki declaration and approved by Faculty of Medicine Cairo University, Research Ethics Committee. Informed written consent was obtained from Dr. Samar Eltahlawy.

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2. Materials and methods

2.1. Population study and clinical assessment

A total of 640 patients suffering from diabetes, 280 patients suffering from cancer and 210 patients suffering from heart diseases from Cairo City were evaluated for dermatophytosis at the dermatology clinics of four different hospitals from January 2005 to December 2006.The assessment of the participants consisted of an interview, clinical examination and collection of specimens for microbiological studies. All patients completed a questionnaire which contained demographic data, patient and family history and specific data related to risk factors for dermatophytosis and candidiasis such as age, gender, physical activities, occupation, predisposing diseases and contact with animals and clinical diagnosis.

2.2. Collection and transport of specimens

The suspected ringworm lesions were cleaned with 70% ethyl alcohol using sterile cotton. For tinea corporis and tinea cruris, the best collection is made by scraping epidermal scales near the advancing edges of ringworm. In tinea capitis, hairs are best sampled by plucking so that the roots are included. The basal root portion of the hair is best for direct microscopy and culture. In "black dot" tinea capitis, a scalpel may be used. In tinea unguium, the common distal-subungual type is traditionally sampled by scraping the debris beneath the distal end of the nail with a scalpel near the nail bed. Superficial white onychomycosis is sampled by scraping material from the white spots on the surface of the nail. In tinea pedis, a sample from the fourth toe clefts of both feet is taken. In cases of pityriasis versicolor, when very little scaling is present, it is possible to take a sample by pressing a strip of sticky tape (sellotape) onto the lesion for the direct examination. Sample materials were transported in dry, strong black paper folded in the manner of a herbarium packet and transferred to the laboratory for direct microscopic examination and culturing[1].

2.3. Microscopic examination and culturing of specimens

The examination was performed following treatment with an aqueous solution of 20% potassium hydroxide mixed with 5% glycerol and heated for 1 h at 50 ˚C. All samples were cultured on sabouraud dextrose agar (CM41; Oxoid, Basingstoke, United Kingdom) supplemented by chloramphenicol (RS78; Oxoid, Basingstoke, United Kingdom) and cycloheximide (RS222; Oxoid, Basingstoke, United Kingdom). It is critical to use a cycloheximide-free medium when non-dermatophytic fungi or yeasts other than *Candida albicans* are suspected to be etiologic agents. The plates were inoculated and incubated at 25 ℃ or 30 ℃ for up to 4 weeks.

2.4. Examination and identification of fungus isolates

Identification of characters included macroscopic and microscopic examination were carried out by using references from Summerbell and Zagnoli *et al.*[4,5].

3. Results

Data in Table 1 indicate the occurrence of different clinical types of tinea in 620 patients with diabetes. The majority of diabetic patients were men (410 representing 66.1%). Eighty one culture-positive diabetic patients were recorded, of which 29 males and 52 females. Tinea pedis was the predominant agent being detected in 18 cases of the males and 23 cases of the females. Tinea corporis and tinea cruris were significantly recorded in the females (15 and 10 cases, respectively). Tinea capitis and tinea versicolor were not reported as etiological agents in patients with diabetes.

Table 1
Occurrence of different clinical types of tinea in 81 cases out of 620 patients suffering from diabetes.

Clinical types of tinea	Male		Female		Total	
	Infected cases	Infection (%)	Infected cases	Infection (%)	Infected cases	Infection (%)
Tinea capitis	0	0.00	0	0.00	0	0.00
Tinea corporis	5	0.81	15	2.42	20	3.23
Tinea cruris	4	0.65	10	1.61	14	2.26
Tinea pedis	18	2.90	23	3.71	41	6.61
Tinea unguium	2	0.32	4	0.65	6	0.97
Tinea versicolor	0	0.00	0	0.00	0	0.00
Total	29	4.68	52	8.39	81	13.10

Among 280 patients (130 males and 150 females) suffering from cancer, more than one quarter (82 cases accounting for 29.29%) were confirmed to be infected with tinea (44 males and 38 females) (Table 2). Tinea capitis and tinea cruris were the most detected clinical types in males (15 and 8 cases, respectively), while tinea capitis and tinea pedis were significantly more common in females (11 cases for each).

Table 2
Occurrence of different clinical types of tinea in 82 out total 280 patients suffering from cancer.

Clinical types of tinea	Male		Female		Total	
	Infected cases	Infection (%)	Infected cases	Infection (%)	Infected cases	Infection (%)
Tinea capitis	15	5.36	11	3.93	26	9.29
Tinea corporis	6	2.14	2	0.71	8	2.85
Tinea cruris	8	2.86	4	1.43	12	4.29
Tinea pedis	7	2.50	11	3.93	18	6.43
Tinea unguium	5	1.79	8	2.86	13	4.65
Tinea versicolor	3	1.07	2	0.71	5	1.78
Total	44	15.71	38	13.57	82	29.29

Table 3 indicates the occurrence of clinical types of tinea in 30 out of a total of 210 patients (110 males and 100 females) suffering from heart diseases. Twelve cases of males and eighteen cases of females were reported with tinea. Tinea corporis and tinea cruris (4 cases of each) were the main clinical types in males, while tinea pedis and tinea unguium (6 and 5 cases, respectively) were common in females.

Table 3
Occurrence of different clinical types of tinea in 30 out of 210 patients suffering from heart diseases.

Clinical types of tinea	Male		Female		Total	
	Infected cases	Infection (%)	Infected cases	Infection (%)	Infected cases	Infection (%)
Tinea capitis	0	0.00	1	0.48	1	0.48
Tinea corporis	4	1.90	2	0.95	6	2.85
Tinea cruris	4	1.90	3	1.43	7	3.33
Tinea pedis	2	0.95	6	2.86	8	3.81
Tinea unguium	2	0.95	5	2.38	7	3.33
Tinea versicolor	0	0.00	1	0.48	1	0.48
Total	12	5.71	18	8.57	30	14.28

4. Discussion

Dermatophytes (*Trichophyton*, *Microsporum* and *Epidermophyton*) invade the keratinized tissues and cause dermatophytosis[6]. The prevalence of dermatophytosis has increased worldwide in recent years, especially in immunocompromised patients[7]. The increasing incidence of diabetes and HIV infection are important contributory factors[8]. Davis reported that candidal intertrigo, as an etiological agent of tinea pedis, may occur in patients with conditions that alter host immunity, such as pregnancy, malignancy, diabetes mellitus, and glucocorticoid therapy[9].

In the present research, population study and clinical assessment of different types of skin mycosis was done in 640 patients suffering from diabetes in some hospitals at Cairo and Giza city.

For diabetic patients, 13.10% were more likely to develop a fungal infection. The presence of diabetes is a risk factor for tinea pedis (6.61% of diabetic patients) and tinea corporis (3.23%). Tinea cruris and tinea unguium were not common among diabetics, while tinea capitis and tinea versicolor were completely missed. Some authors have stated an increase in occurrence of tinea unguium and tinea pedis (nail and feet dermatophytoses, respectively) in diabetic patients in comparison with nondiabetic population, whereas others could not prove this increase in occurrence of these infections in well-controlled diabetic patients[10]. Yosipovitch *et al*.[11] stated tinea pedis in 36% of their young type 1 diabetic patients compared to only to 7% in control subjects. Mansour and Hamdi reported that tinea pedis reached up to 24% among diabetic patients and related this high ratio of infection to age and rural residency[12].

Tinea capitis followed by tinea pedis were observed in 9.29% and 6.43% among patients suffering from cancer. The relatively high ratio of tinea capitis among cancer patient may be due to the use of radioactive irradiation for cancer treatment which lead to shedding of scalp hairs rendering the cuticle vulnerable and susceptible to penetration by fungi deep within hair follicle below the level of mature cuticle. Ahmed *et al*.[13] reported a decrease in colony-forming ability of skin fibroblast as result of radiosensitivity and radioinduced inhibition in the level of DNA synthesis.

The present investigation could help to estimate the problem more accurately in future. Moreover, awareness of the preventive measures regarding public health and maintenance of personal hygiene could reduce the incidence of dermatophytosis, hence, the burden of this disease in the community as a whole.

Conflict of interest statement

We declare that we have no conflict of interest.

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