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Original Article

The Incidence of Dermatophytosis in Babylon Province, Iraq

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Abstract

Background: Dermatophytosis is caused by dermatophytes, which attack and grow on dead animal keratin. Dermatophytes belong to three genera, namely, *Epidermophyton*, *Microsporum*, and *Trichophyton*. **Objective:** The objective of this study is to detect the types and the frequencies of the dermatophytes infections in Babylon Province. **Materials and Methods:** In this study, 200 specimens of dermatophytic patients are collected in Babylon Province. Collection of Specimens includes skin scrapings, hair fragments, and nail clippings. The specimens were diagnosed by direct microscopic examination and culture. **Results:** One hundred and sixty-four (83%) specimens of dermatophyte infection were positive in culture and used in phenotypic diagnosis. Tinea corporis was the predominant infection in 83 (41.5%) patients, *Trichophyton rubrum* showed the highest frequency of dermatophytes isolates 29 (17.68%), *Trichophyton mentagrophytes* 26 (15.85%), and *Microsporum canis* 24 (14.63%). Fifty-six cases were positive in direct microscopic examination, and the invasion of hair was ectothrix type, forming masses of arthroconidia on the outside of the hair shaft in 44 (78.57%) specimens, while the invasion of hair was endothrix type, and abundant sporulation inside the hair shaft causes breakage of the hair near the surface of the scalp in 12 (22.43%) specimens ($P < 0.05$). The age group of 21–30 years revealed tendency for dermatophytosis of *tinea corporis* while the age group of 1–10 years showed tendency for dermatophytosis of tinea capitis. **Conclusion:** Tinea corporis was the predominant infection. *T. rubrum*, *T. mentagrophytes,* and *M. canis* showed the highest frequency of dermatophyte isolates. Positive direct microscopic examination and culture isolates (phenotypic diagnosis) could be used in the diagnosis of dermatophytosis.

Keywords: Dermatophytosis, incidence, *Microsporum canis*, *Trichophyton mentagrophytes*, *Trichophyton rubrum*

Introduction

Mycotic diseases are global in distribution. Mycoses are important from public health and economic point of view. Globally, 800 million people in the world have suffered from one or other types of fungal diseases. *Aspergillus*, *Candida*, and other genera are important opportunistic fungi responsible for high mortality, especially in immunocompromised hosts.[1,2]

The cutaneous mycoses, mainly caused by dermatophyte fungi, are among the most common fungal infections worldwide, affecting several age groups and adversely affecting the quality of life of infected patients.[3,4] Skin, hair, nail, and subcutaneous tissues in humans and animals are subjected to infection by several organisms, mainly fungi named dermatophytes which cause dermatophytosis.[5] The dermatophytoses are dermatomycoses caused by a specific group of fungi known as ringworm or tinea, comprising the genera *Microsporum*, *Trichophyton*, and *Epidermophyton*.[6] Transmission of dermatophytes may occur by direct contact with infected humans or animals or indirectly by contact with contaminated fomites.[7] Dermatophytes require keratin for growth and they can cause superficial infections of the skin, hair, and nails. Dermatophytes may spread by direct contact from other people (anthropophilic organisms), animals (zoophilic organisms), and soil (geophilic organisms) as well as indirectly from fomites. The disease is widely distributed all over the world with various degrees and more common in men than in women.[8]

The aim of this study was to detect the types and the frequencies of the dermatophyte infections in Babylon Province, Iraq.

Materials and Methods

A total of 200 specimens were collected from patients with dermatophytosis (ringworm). They were recruited for the

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current study after attending to the consultant of Dermatology in Marjan Hospital, Al-Hilla Teaching Hospital, and private clinics in Babylon Province, Iraq. There are three types of specimens collected: 123 skin scrapings, 48 hair fragments, and 29 nail clippings.

Dermatophytes isolates can be diagnosed by direct microscopic examination with 10%–20% KOH and using several physiological tests such as production of urease, hair perforation test, vitamin requirement test, growth on rice grains, growth on 1% peptone agar medium, growth on dermatophyte test medium, and producing reverse pigments in other culture media.[9]

Results

The results proved that 146/200 (73%) specimens were positive in both direct examination and culture, 21/200 (10.5%) specimens were positive in direct examination and negative in culture, and 18/200 (9%) specimens were negative in direct examination and positive in culture, while the cases of negative results in both direct examination and culture were 15/200 (7.5%) specimens [Table 1].

The study also revealed that 56 cases were positive on direct microscopic examination. The invasion of hair (ectothrix type) forming masses of arthroconidia on the outside of the hair shaft in 44 (78.57%) specimens, while the invasion of hair (endothrix type) with abundant sporulation inside the hair shaft causes breakage of the hair near the surface of the scalp in 12 (22.43%) specimens.

Tinea corporis was the predominant infection which is recorded in 83 (41.5%) patients followed by tinea capitis 49 (24.5%), tinea pedis 42 (21%), tinea cruris 12 (6%), tinea unguium 7 (3.5%), tinea manuum 4 (2%), tinea faciei 2 (1%), and tinea barbae 1 (0.5%) of patients [Table 2]. This result was in agreement with a study done by Pakshir and Hashemi[8] who found that the main two isolates of tinea infection were tinea corporis (47.77%) and tinea capitis (18.47%) in Najaf Province.

Out of a total of 200 investigated specimens, 164 (82%) yielded growth of dermatophytes. Isolates were cultured on the traditional culture media and considered as positive specimens which were used in the phenotypic diagnosis.

Nine of the dermatophytes species were identified in specimens of examined patients, out of them, in *Trichophyton rubrum,* 29 (17.68%) isolates showed the highest frequency followed by *Trichophyton mentagrophytes* 26 (15.85%), *Microsporum canis* 24 (14.63%), *Trichophyton tonsurans* 22 (13.41%), *Epidermophyton floccosum* 20 (12.2%), *Trichophyton ajelloi* 17 (10.37%), and *Microsporum gypseum* 12 (7.32%), and finally *Trichophyton schoenleinii* 9 (5.49%) and *Microsporum audouinii* 5 (3.05%) isolates [Table 3].

The age revealed a significant correlation with clinical types of dermatophytosis ($P < 0.05$), especially with tinea corporis. The age group of 21–30 years revealed tendency for dermatophytosis of *Trichophyton corporis* while the age group of 1–10 years showed tendency for dermatophytosis of tinea capitis [Table 4].

In this study, among 200 patients who were diagnosed with dermatophytose infection, the males were 142 (71%) which is marginally higher than the rate of females 58 (29%, $P < 0.05$).

Table 1: Distribution of diagnostic specimens by direct examination and culture

Clinical case examination	*n* (%)
Positive in both direct examination and culture	146 (73)
Positive in direct examination and negative in culture	21 (10.5)
Negative in direct examination and positive in culture	18 (9)
Negative in both direct examination and culture	15 (7.5)
Total	200 (100)

Table 2: Distribution of clinical types of the isolated tinea infections

Clinical types	*n* (%)
Tinea corporis	83 (41.5)
Tinea capitis	49 (24.5)
Tinea pedis	42 (21)
Tinea cruris	12 (6)
Tinea unguium	7 (3.5)
Tinea manuum	4 (2)
Tinea faciei	2 (1)
Tinea barbae	1 (0.5)

Table 3: Distribution of the isolated dermatophyte spp.

Dermatophyte spp.	*n* (%)
Trichophyton rubrum	29 (17.68)
Trichophyton interdigitale	26 (15.85)
Microsporum canis	24 (14.63)
Trichophyton tonsurans	22 (13.41)
Epidermophyton floccosum	20 (12.2)
Trichophyton ajelloi	17 (10.37)
Microsporum gypseum	12 (7.32)
Trichophyton schoenleinii	9 (5.49)
Microsporum audouinii	5 (3.05)

Discussion

During the period of the present study, the results of direct examination revealed that it was very essential, as it allows the clinician to start treatment, pending culture. Although false-negative results in both direct examination and culture have been reported in 15 (7.5%) specimens in routine practice, these depend essentially on the skill of the observer and on the quality of sampling. Cultures remain negative in spite of the positivity of direct examination in 21 (10.5%) specimens.

Results of this study found that the foregoing results showed that the ectothrix-type invasion was the prevalence type of hair infection (significant effect $P < 0.05$), and this result is

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Table 4: Distribution of dermatophytosis according to age of patients

Clinical types	Age group (years)							*n* (%)
	1-10	11-20	21-30	31-40	41-50	51-60	61-70	
Tinea corporis	4	10	31	16	11	5	6	83
Tinea capitis	38	7	3	1	0	0	0	49
Tinea pedis	0	4	8	9	11	6	4	42
Tinea cruris	1	2	3	4	2	0	0	12
Tinea unguium	0	1	1	5	0	0	0	7
Tinea manuum	0	1	0	1	1	1	0	4
Tinea faciei	0	0	1	0	1	0	0	2
Tinea barbae	0	0	0	1	0	0	0	1
Total, *n* (%)	43 (21.5)	25 (12.5)	47 (23.5)	37 (18.5)	26 (13)	12 (6)	10 (5)	200 (100)

consistent with a study done by Muhammad *et al*., Ali, Abass, and Hassan[10-13] and is in discordance with the results of Gargoom *et al.*, Basnet *et al.*, and Morar *et al*.[14-16]

Results also found that *T. rubrum* isolates showed the highest frequency followed by *T. mentagrophytes*. This result was in agreement with that of Costa *et al.*,[17] who found that *T. rubrum* was the most frequently isolated species (49.4%) followed by *T. mentagrophytes* (30.8%) and *M. canis* (12.6%). Infections caused by dermatophytes are widespread, increasing in prevalence on a global scale, and have been considered a major public health concern in some areas of the world, which accounts for as many as 69.5% in humans.[18]

The direct microscopic examination shows false-negative results in 18 (9%) of specimens. This is relatively in accordance with a study done by Liu *et al.,*[19] who found false-negative results up to 19%. These false-negative results may be related to an insufficient amount of material or a specimen poor in fungal elements, but also to a too short incubation time, a nonsuitable temperature, or the presence of "contaminants" which can prevent the development of the pathogen.

Tinea capitis is considered a disease of childhood; as seen in this study, adults are rarely affected. This prevalence is due to the absence of sebum secretion and colonization by *Malassezia* spp. characteristic of childhood, which reduce the ability of the scalp to protect itself from infection by these dermatophytes.[20] Furthermore, children are more exposed to other risk factors, such as poor hygiene, crowded enclosed places (daycare facilities and schools), direct contact with household pets, and playing with sand.[21]

In addition to the well-known superficial infections caused by this organism, such as tinea capitis, tinea corporis, tinea unguium, and tinea pedis, dermatophyte species are also responsible for deep dermal invasion in immunocompromised patients. Moreover, dermatophytosis infections are often intractable, and relapse frequently occurs after cessation of antifungal therapy.[22] Furthermore, dermatophytes are parasitic fungi that infect skin, hair, and nails of both humans and animals; they are the primary causative agent of dermatophytosis, a major public health concern in some geographic regions.[23] While not fatal, dermatophyte infections cause significant morbidity and are of significant cost to society because of their chronic nature and resistance to therapy. Dermatophytes encompass three genera; the following three species, *T. rubrum, T. mentagrophytes, and M. canis,* are the most common species in hospital isolates (72%–95%).[24] Dermatophytosis has been reported to be encouraged by hot and humid conditions and poor hygiene and occurs throughout tropical and temperate regions of the world.[25]

The reason for increased percentage of males may be due to the fact of increased outdoor exposure and more physical work that results in increased sweating and less cosmetic consciousness compared to females.[26]

Conclusion

Tinea corporis was the predominant infection. *T. rubrum*, *T. mentagrophytes*, and *M. canis* showed the highest frequency of dermatophyte isolates. Positive direct microscopic examination and culture isolates (phenotypic diagnosis) could be used in the diagnosis of dermatophytosis.

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Conflicts of interest

There are no conflicts of interest.

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