

# Chronic dermatophytosis: A clinical, epidemiological, mycological study

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## ABSTRACT

**Background:** Dermatophytes are a common cause of superficial fungal infection of the skin. The emergence of epidemic-like attacks of those chronic and recurring represents a public health problem. **Materials and Methods:** Two hundred patients with suspected fungal infection of the skin attending the Dermatology and Venereology Department of Al-Ramadi Teaching Hospital were examined. Fifty-nine patients with chronic dermatophytosis were selected for the study and fifty of those were subjected for culture. History taking and a physical examination were conducted for all patients. A wet mount of 10% potassium hydroxide and culture on Sabouraud dextrose agar was done for selected cases. **Results:** Among 59 patients with chronic infections, the main age group affected was 29 years old, with a nearly equal sex ratio. The mean duration of the illness was 1.2 years. Tinea corporis was the most common type. The *Trichophyton* genera were the most common (65%), and *Trichophyton mentagrophyte* was the most common species isolated (46%). **Conclusion:** Multiple factors have been associated with the appearance of epidemic-like attacks of chronic dermatophyte infections in Iraq in the last several years. Herein, we would like to shed light on these factors and the pathogens responsible.

**Keywords:** Ringworms; Dermatophytes; Chronic Infections; Potent steroids

## INTRODUCTION

Fungal infections attacking humans are classified into three forms: superficial, subcutaneous, and systemic [1]. Dermatophytes are one of the fungi that digest the keratin in the skin, hair, and nails [2]. They are classified into three genera: *Trichophyton*, *Microsporum*, and *Epidermophyton*; and into anthropophilic, geophilic, and zoophilic, according to the mode of transmission [3]. They may affect any site on the body and are clinically known according to that site [4]. In the last years, several terms have been used to describe persistent fungal infections, such as chronic, recurrent, and recalcitrant dermatophytosis [5-7]. In this study, chronicity will be applied to an infection lasting more than six months, with the presence or absence of recurrence despite treatment. Multiple factors in the environment and host and the infecting agents affect the chronicity of an infection. Environmental factors such as weather changes and hot and humid climates are

a favorable environment for fungal growth [5,7]. Host factors involve frequent use of antifungal and steroid combinations, noncompliance of the patient with antifungal drugs, obesity, and sedentary lifestyle [7]. Frequent migration of people enhances the spread of the infection with a special strain such as *Trichophyton mentagrophyte* [8]. A defective immunological status, poverty, and overcrowding are mostly associated with chronic infection [5,7,9]. Infecting agents involve the emergence of novel antifungal, drug-resistant strains of dermatophytes [10,6]. Biofilm produced by some species of dermatophytes enhances virulence and hence chronicity [11]. The immune response is ameliorated to escape the detection by the host immune system [12].

## MATERIALS AND METHODS

This study was conducted in the Dermatology and Venereology Department of Al-Ramadi Teaching Hospital and College of Science, Al-Anbar University.

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After obtaining ethical approval from the institution, two hundred patients suspected to be infected with different types of tinea were examined in the period of six months, from March 2020 to August 2020. We selected cases lasting more than six months despite treatment. After excluding patients affected with tinea capitis and tinea unguium, 59 patients with chronic infection were subjected for this study and 50 of them were subjected for culture. Informed consent was taken from all patients. A detailed history was taken from the patients regarding the duration of the illness, contact with animals, other affected family members, the presence of medical diseases, immunosuppression, a drug history, topical steroid use, migration to other countries, and compliance with drug regimens. A physical examination of the skin, hair, and nails, in addition to laboratory investigations, was performed. The affected skin was cleansed with 70% alcohol and scales were taken from the active border of the lesion with a sterile surgical blade. The scales were divided into two parts: one for direct microscopical examination with a 10% potassium hydroxide (KOH) mount, the other enclosed in a dark, dry paper and sent for culture in Sabouraud dextrose agar (SDA), being incubated at 28°C for at least four weeks. The exact dermatophyte species were identified by the appearance of the growth of a fungal colony in the culture and their microscopic features after using lactophenol cotton blue.

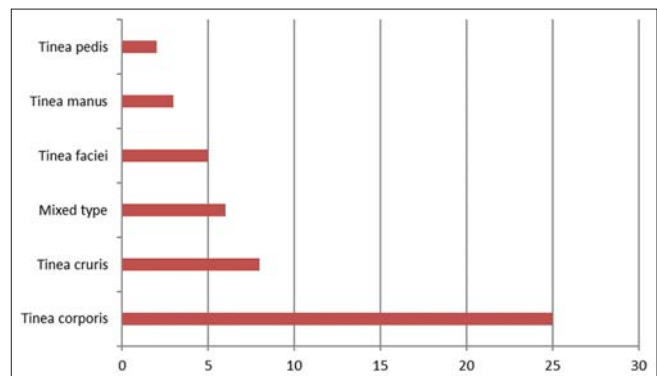
## RESULTS

Fifty-nine patients with chronic dermatophytes infection were evaluated. The patients' age ranged from 2 to 64 years, with a mean age of 29 years and a nearly equal sex ratio. The duration of the infection ranged from 6 months to 6 years, with a mean of 1.2 years. A family history of involvement was present in 66% of the cases, and their residence was rural in 74%. There were different types and sites of involvement in the same patient. The most common clinical type was tinea corporis and tinea cruris (Figs. 1–3). Wet mount of the specimens with 10% KOH was positive in 80%. The culture results were positive in 74% of the cases. Macroscopical and microscopical studies of the growth demonstrated that the *Trichophyton* genera were the most common infecting agents (Fig. 4). Within the *Trichophyton* genera, the *Trichophyton mentagrophyte* species was the most common (Table 1).

## DISCUSSION

Superficial fungal infections are common issues that affect around 20–25% of people worldwide, with 30–70%

of the adult population being asymptomatic carriers of dermatophytes [13,14]. Previously, infection with dermatophytes was thought to be an easy to treat disease in dermatological clinics yet, in the last several years, this notion has changed due to the appearance of numerous cases of infections in different parts of the world that are difficult to treat. The incidence of chronic dermatophyte infections in the present study was 29.5%. In other parts of the world, there is a steady increase in the incidence of this infection, as described by Pathania et al. [15] and Sharma et al. [16]. Apart from tinea capitis that mainly affects children [17], dermatophyte infection mainly attacks post-pubertal ages, around the age of 20–30 years. Males are more frequently involved than females due to the more frequent outdoor occupational activities in males, which exposes them to a hot and sweaty environment that encourages dermatophyte growth [18,19]. In the present study, all age groups were affected and both sexes were involved equally, which was also observed by Verma et al. [20]. Overcrowding and the involvement of more than one family member in addition to farm work exposing to hot, sweat, and contact with animals all predispose to the contraction of infection [15]. There exist different types and forms of dermatophyte infections. Usually, more than one site



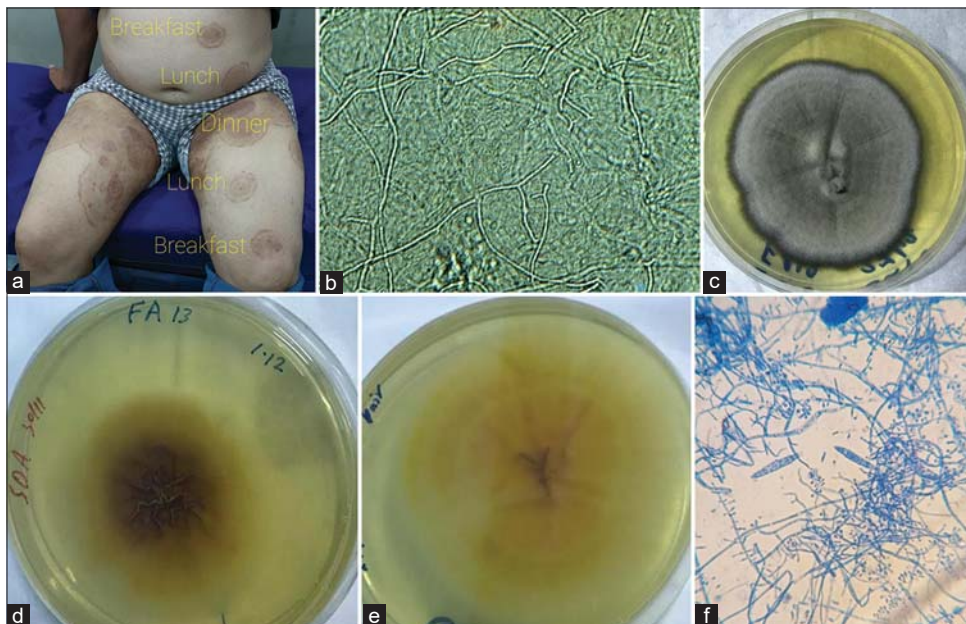
**Figure 1:** Clinical types of chronic dermatophyte infections.

**Table 1:** Distribution of dermatophyte species in the present study.

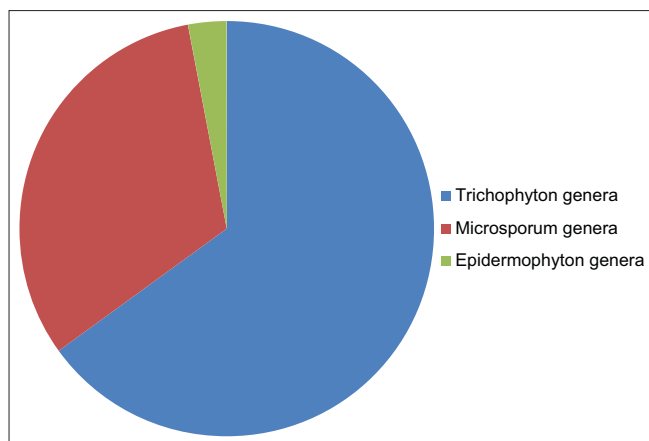
Dermatophyte Genera	%	Dermatophyte Species	%
<i>Trichophyton</i>	65	<i>Trichophyton mentagrophyte</i>	46
		<i>Trichophyton rubrum</i>	29.2
		<i>Trichophyton interdigitale</i>	8.3
		<i>Trichophyton tonsurans</i>	8.3
		<i>Trichophyton soudanese</i>	4.1
		<i>Trichophyton verrucosum</i>	4.1
<i>Microsporum</i>	32	<i>Microsporum canis</i>	66.7
		<i>Microsporum ferrugineum</i>	33.3
<i>Epidermophyton</i>	3	<i>Epidermophyton floccosum</i>	3



**Figure 2:** (a-c) Multiple annular lesions of ringworms affecting the hands, legs, and the knee in the same patient. (d) Tinea pedis. (e) Tinea modified by steroids. (f) Tinea faciei.



**Figure 3:** (a) Multiple annular lesions of tinea cruris and tinea corporis. (b) Wet mount with 10% KOH demonstrates fungal hyphae. (c and d) Macroscopic appearance of the growth of *Microsporum canis*, anterior surface: white to yellow, hairy with radial grooves. (e) Macroscopic appearance of the growth of *Microsporum canis*, reverse surface: yellow coloration. (f) Lactophenol cotton blue mount of *Microsporum canis* shows macroconidia.



**Figure 4:** Distribution of the dermatophyte genera.

is affected. Severe itching, erythema, and the double-edge sign are present. The most common type is tinea corporis followed by tinea cruris. All these features are present in the epidemic-like infection reported by Verma et al. [20]. In the present study, *Trichophyton mentagrophyte* was the most common infecting agent, which was also found in recent studies by Sheikh et al. [21], Pathania et al. [15], and others [22,23]. Previously, *Trichophyton rubrum* was the most infective agent, but recently there has been a shift toward *Trichophyton mentagrophyte* [17]. Numerous factors are involved in changing the virulence of the pathogen, some related to the environment and host and the infective agent or immunological factors [24,25]. In our locality, we believe that the frequent travel of people to regions in which new strains and drug-resistant species appear as with religious tourism and medical treatment will help to disseminate the new infecting agents [26]. Also, this small area of the world was exposed to different terrorist waves, which has led to displacing people from their homes and, as a result, overcrowding and poverty in refugee camps. This may indicate the presence of 4.1% of *Trichophyton* infections related to *Trichophyton soudanense*, which is endemic to the sub-Saharan Africa region and only some sporadic cases are reported [27]. Lastly, the pandemic of COVID-19 that has recently affected the entire world will intensify the problem [28]. In addition to that, 74% of these chronic cases are in contact with farm work and animal domestication, which will facilitate the transmission of the pathogens.

## CONCLUSION

In the last several years, difficult-to-treat dermatophyte infections have appeared in different parts of the world,

including Iraq. There has been a similarity to factors encouraging the appearance of this epidemic-like infection. For this reason, extensive efforts are required to overcome this with further studies. Also, advanced molecular investigations are essential to discover new species and subspecies of dermatophytes.

## Statement of Human and Animal Rights

All the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the 2008 revision of the Declaration of Helsinki of 1975.

## Statement of Informed Consent

Informed consent for participation in this study was obtained from all patients.

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