Case Study

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Epidemiological Study of the most Important Dermatophyte Infections in Musayyib General Hospital, Iraq

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دراسة وبائية لأهم الاصابات الفطرية من المستشفى العام في المسيب، العراق

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ABSTRACT

Background:
Dermatophytes are keratophilic fungi that consider exogenous organisms, and cause serious infections of the skin, hair, and nails. The main goal of the current study is to present a survey of fungal skin infections in Musayyib general hospital of Babylon Province Iraq, through the identification of the incidence of some types of Tineae and the extent of spread in different age groups.

Materials and Methods
A256 patients clinically suspected of dermatophytosis, 210 were positive in direct examination and/or culture. From the positive patients' sample that includes skin scrapping, hair fragments, and nails

Results
The current study showed that Dermatomycosis infected in males more than females with a ratio of 151 (71.90 %) males and 59 (28.09%) females. The highest percentage of infection with Tinea capitis appeared in males , while the lowest percentage of infection with Tinea ungums with a rate equal between males and females. According to age groups.

Conclusions
According to the findings of the study, it absolves that although Covid 19 pandemic the world went through fundamental changes by increasing the level of understanding and awareness of people to use different sterilizers and detergents. In addition to reducing contact between people and taking care of personal hygiene. Unfortunately, these procedures did not have a positive effect on reducing dermatophytosis infection in Musayyib General Hospital.

Keywords: Dermatophyte fungi, Pathogenesis, Skin infection, Tinea infection

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INTRODUCTION

Dermatophytes are keratophilic fungi that consider exogenous organisms and cause serious infections of the skin, hair, and nails [1] . The early report of dermatophytes presence was recorded in (30 BC) as the Roman Encyclopedia described the infection that occurs in the scalp, and it was called (Kerion) by Aulus Cornelius Celsus [2] .The medical importance of Dermatophytes comes from their ability to produce the keratin-dissolving enzyme which considers one of the most important characteristics to distinguish this group of fungi. Numerous approaches for the spread of dermatophytes which by either direct contact with other people (anthropophilic organisms), animals (zoophilic organisms), and soil (geophilic organisms), or indirectly from sharing infectious tools. Generally, they contain three major genera *Epidermophyton*, *Trichophyton*, *Microsporum* , *Epidermophyton* genus includes one species while the genus Trichophyton, Microsporum consortium of many species [3].These filamentous fungi can cause dermatophyte infections (Dermatophytosis or Tinea). Filamentous dermatophytes are unable to surpass living tissue under the skin unless in rare cases, such as tumors Mycetoma and abscesses drive these pathogens into the deep tissues [4]. A skin infection outbreak in many regions of southern Iraq, and Babylon is experiencing extremely hot weather, both of which increase the risk of skin diseases in patients. Therefore, the purpose of this study was to ascertain the frequency of skin conditions at Musayyib General Hospital and to explain their relationships with various parameters.

MATERIALS AND METHODS

Specimen collection

The investigation study was conducted from January to June 2023 in the Musayyib General Hospital. A total of (256) patients after obtaining patients' permission, the record-keeping of each clinical history should be based on detailed records of each study patient, and depending on the standard procedure for the collection of samples was following after the lesion area sterilized properly (with 70% ethyl alcohol), skin scales/crusts and pieces of nails were, collected by gentle scraping across the inflamed margin of the lesions with sterile scissors. Hairs were epilated aseptically with sterilized tweezers, in addition to avoiding contamination of specimens, the scalpels were replaced for each sample as seen in Figure 5 [4,5].

Physiological and biochemical tests for the diagnosis of dermatophytes

1 . Hair perforation test

The hair perforation test consists of inoculating mycelium into a sterilized glass dish containing a few amounts of sterile water, adding an amount of yeast extract solution, mixing with unmatured human hair, and incubating at (28±2) °C and (10-14) days taken and placed on a sterile glass surface and examined after adding lactophenol blue dye. The test is considered positive if the hair has deep, narrow wedge-shaped perforations in it [6]

2. Hydrolysis of Urea test

Test tube containing urea agar inoculum with a fungal colony at the age of (10) days and incubated at (28±2) °C for a couple of weeks. Complete decomposition of urea happens when

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the yellow color of the medium changes into red or dark pink. In the case of partial decomposition, the color of the yellow medium changes to light pink. In the event that the fungus is unable to decompose urea, the color remains yellow without change [7]

RESULTS AND DISCUSSION

The current study was intended to isolate and identify various types of dermatophytes causing dermatophytosis at Musayyib General Hospital, Iraq. A total of 256 samples were included in this present study. Of which, 192 (75%) were skin samples, 4 (1.56%) were nail samples and 60 (23.43%) were hair samples. Only 210 samples were positive in culture as seen in Table (1). Of which, 162 (77.14%) were skin samples, 2 (0.95%) were nail samples and 46 (21.90%) were hair samples. The Percentage of Males was 151 (71.90 %) while females were 59 (28.09%). showed in Figuer1

Table 1. Percentage of positive in direct examination and/or culture of different samples.

Sample	Positive in direct examination			Chi-square-χ^2	Positive in culture.			Chi-square-χ^2
	M	**F**	**Total%**		**M**	**F**	**Total%**	
Skin scrapping	**132 51.56%**	**60 23.43%**	**192 75%**	**19.43**	**116 55.23%**	**46 21.90%**	**162 77.14%**	**34.48**
Hair fragments	**40 15.62%**	**20 7.81**	**60 23.43%**	**6.37**	**36 17.14%**	**10 4.76%**	**46 21.90%**	**4.73**
Nail	**2 0.78%**	**2 0.78**	**4 1.56%**	**0.732 NS**	**2 0.95%**	**0.00**	**2 0.95%**	**0.573 NS**
Total	**154 67.96%**	**82 32.03%**	**256 100%**	**38.29**	**151 71.90 %**	**59 28.09%**	**210 100%**	**47.67**
(P≤0.05) *								

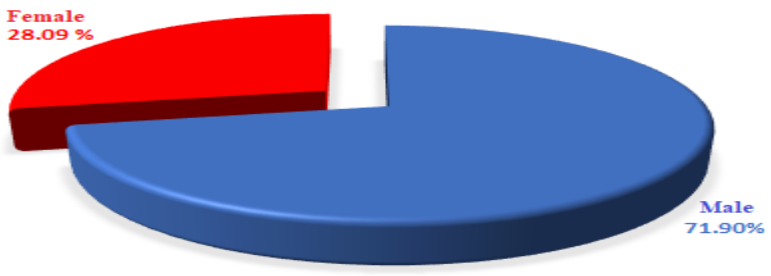

Fig. 1 The percentage of infection according to the sex of the patient

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Results in Figure 2, showed that the frequency of infection was more during the cool months of the year. It was observed that the percentage of infection increased towards the middle winter season, in which the highest percentage of infection was recorded in males during the months of January, February, March, and April (18.50%), (17.18%), (16.01%) and (14.01%) respectively. While the lowest rate of infection during the month of June was (1.95%). In addition, the percentage of Dermatophytes infection in females was lower compared to males. the higher value was during February (12.50%) while the lower value was in worm season May and June (2.34 % and 0.00%) respectively.

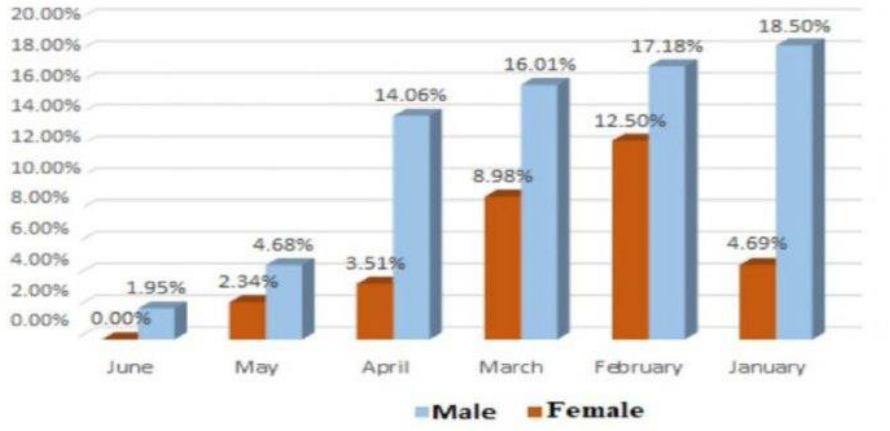

Fig.2 The percentage of Dermatophytes infection and their relationship with months of the year, X : Dermatophytosis ,Y: Percentage of dermatophytes

The results showed in Table 2 , figure 3and 4 that the infections were distributed on the basis of gender (males, females), as *Tinea capitis*, *Tinea cruris*, *Tinea manuum*, *Tinea pedis*, *Tinea corporis Tinea faciei* constituted the highest percentage of infection in males, which were 40 (19.04%), 36 (17.14%), 23 (10.95%) , 18(8.57%), 18(8.57%), 14 (6.66%) respectively, while the highest infection rate in females was *Tinea manuum* 23 (10.95%), *Tinea capitis* of 16 (7.61%), both in *Tinea pedis* and *Tinea corporis* was 6(2.85%) while, both in *Tinea faciei* and *Tinea cruris* was 4 (1.90) . Finally, the lowest infection in both males and females was in *Tinea unguium* with a percentage of 2 (0.95%).

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Table 2. Distribution of clinical types of dermatophytosis in relation to age and gender among the study population (N =210)

Clinical types	Age group (n%)					Gender (n%)		Total%
	10 ≥	11-20	21-30	31-40	41≤	Male	Female	
(Tinea corporis)	6 (2.85)	2 (0.95)	8 (3.80)	4 (1.90)	4 (1.90)	18 (8.57)	6 (2.85)	24 (11.42)
(Tinea capitis)	28 (13.33)	0 (0.00)	18 (8.57)	8 (3.80)	2 (0.95)	40 (19.04)	16 (7.61)	56 (26.66)
(Tinea pedis)	22 (10.47)	0 (0.00)	0 (0.00)	2 (0.95)	0 (0.00)	18 (8.57)	6 (2.85)	24 (11.42)
(Tinea manuum)	10 (4.76)	12 (5.71)	12 (5.71)	10 (4.76)	2 (0.95)	23 (10.95)	23 (10.95)	46 (21.90)
(Tinea unguium)	0 (0.00)	0 (0.00)	2 (0.95)	2 (0.95)	0 (0.00)	2 (0.95)	2 (0.95)	4 (1.90)
(Tinea faciei)	2 (0.95)	2 (0.95)	10 (4.76)	4 (1.90)	0 (0.00)	14 (6.66)	4 (1.90)	18 (8.57)
(Tinea cruris)	4 (1.90)	8 (3.80)	18 (8.57)	6 (2.85)	2 (0.95)	36 (17.14)	4 (1.90)	38 (18.09)
Total	72 (34.28)	24 (11.42)	68 (32.38)	36 (17.14)	10 (4.76)	151 (71.90)	59 (28.09)	210 100%
Chi-square- $\chi 2$	(1.34)	(3.76)	(4.32)	(2.48)	(0.45)NS	(7.66)	(1.34)	-
*(P≤0.05)								

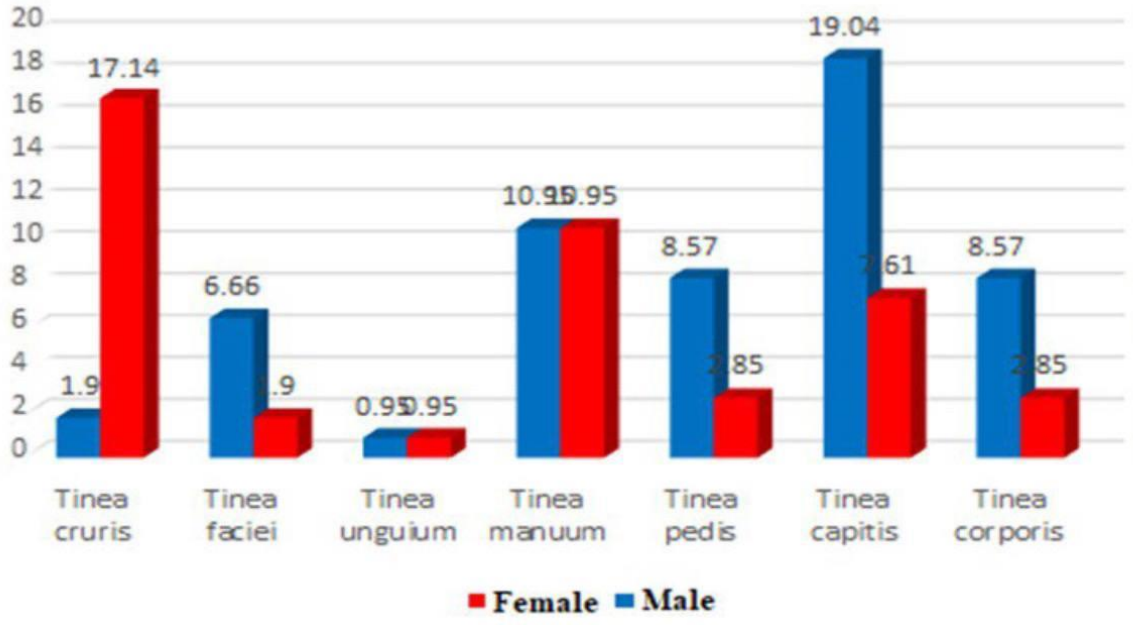

Fig.3 The percentage of clinical types of Tineae according to gender

X:Type of Tineae , Y: Frequency ratio of Male and Female

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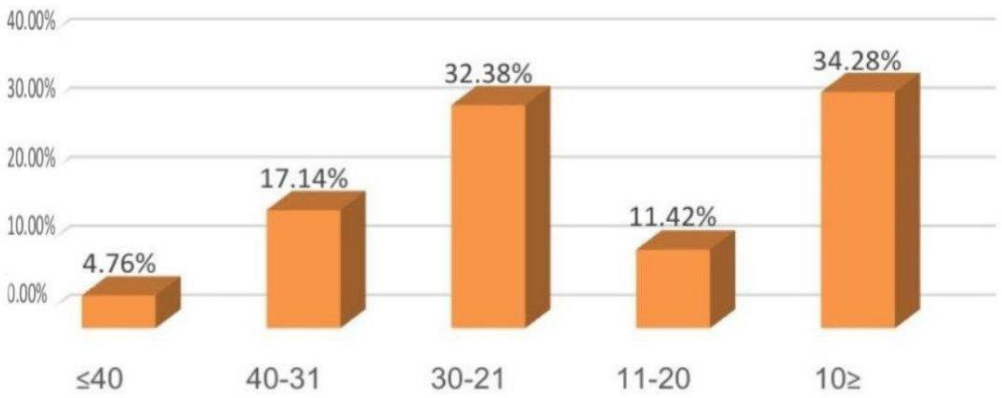

Fig.4 The percentage of infection according to the age group, X:Type of Tineae , Y: Frequency ratio of Male and Female

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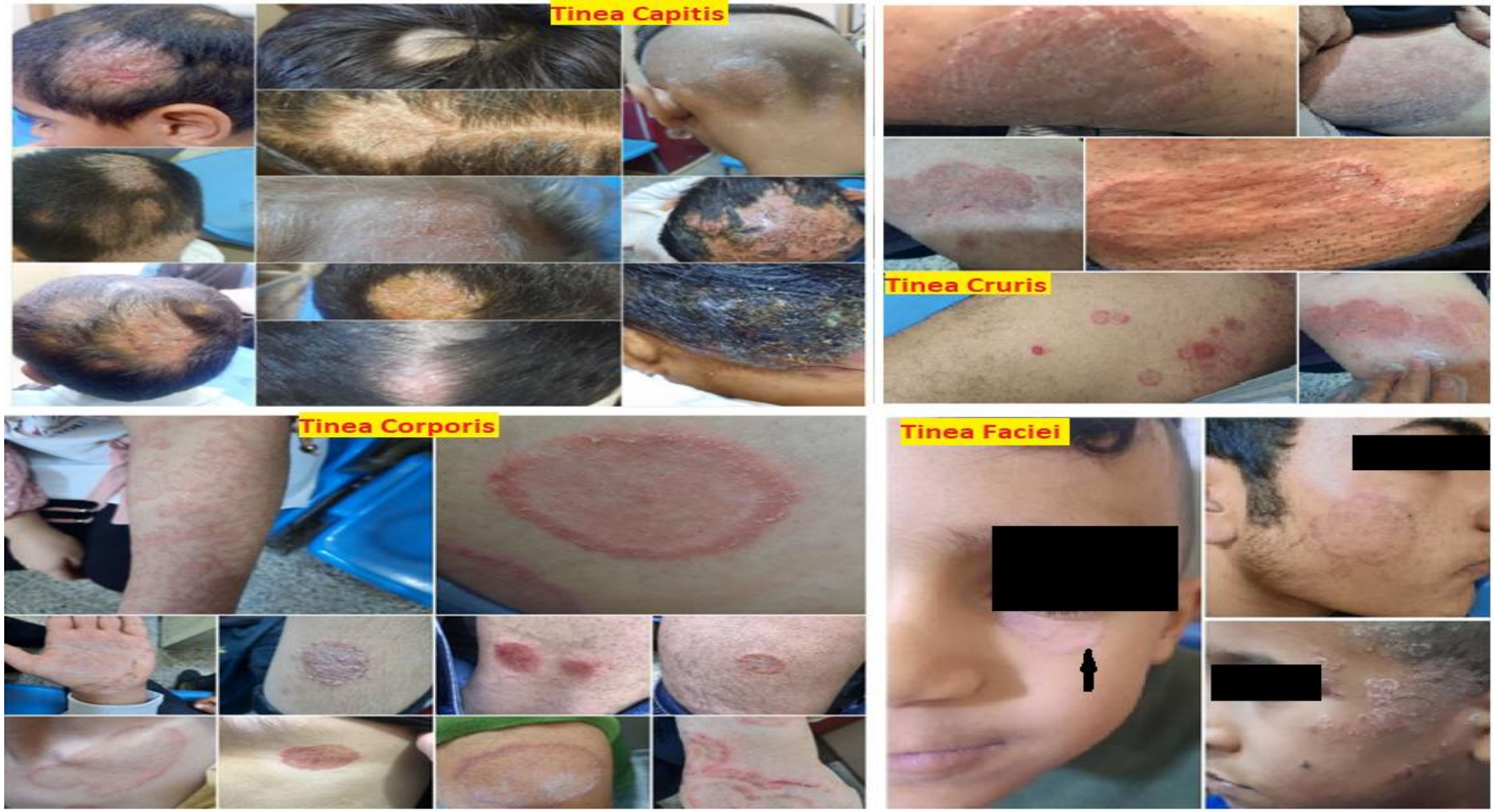

Fig.5 Patients with various types of Tineae

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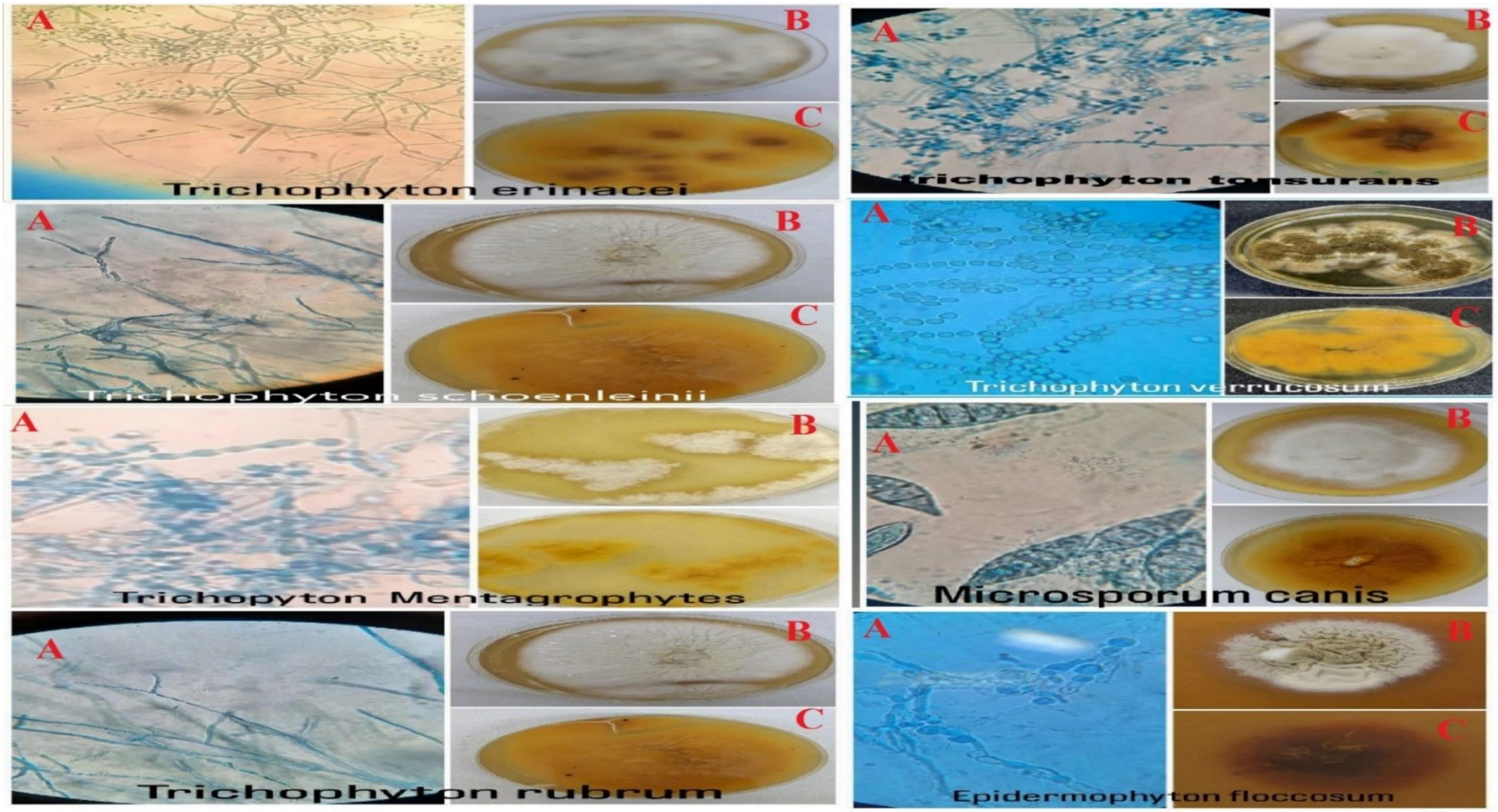

Fig .6 Microscopic observation of dermatophytes fungi that isolate A: Mycelia morphology under the optical microscope at 100X. B: Dermatophytes Fungal colony on SDA after 7 days at 28°C. C: Reverse view of SDA plate culture growing the dermatophytic fungus.

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Table .3 General characteristics of isolate dermatophyte fungi.

Dermatophyte types	Characteristics of colony	Characteristics of large conidia	Characteristics of small conidia	Hair perforation test	Lipolytic activity test	Protolytic activity test
T.rubrum	The colonies are generally white, but turn reddish with time, a color that is also found on the edges. The reverse of the colony also turns reddish with time, or different shades of brown in some strains.	Macroconidia, when present, are long with nearly cylindrical clavate shape, with two to nine septations. The presence of these macroconidia is not a defnitive diagnosis of the species	Optical microscopy reveals a large number of fine, regular pyriform microconidia, often arranged in a right angle with the hyphae	_	+	+
T.mentagrophytes	Colonies are generally fat,white to cream in colour,with a powdery to granular surface.	The macroconidia originate laterally in the hyphae or in short pedicles of thin or thick walls and are club-shaped or fusiform, with a size that varies from 4–8 to 8–50 µm.	The microconidia are abundant, spherical, pyriform, or irregularly shaped, with sizes varying from 2–3 to 2–4 µm. The most consistent feature of T. mentagrophytes is the production of globose micro-aleurio spores arranged in groups	+	+	+
T. verrucosum	Colonies are generally white to cream coloured,with a suede like to velvety surface ,pigment may vary from non pigmented to yellow	Macroconidia 2–7 thin transverse septa and it is clavate with a rounded tip and had a smooth surface.	Microconidia ovoidal in shape and adhered to the branching hypha.	_	+	+
T.erinacei	Colonies are gray powdery surface, an elevated cottony center .A granular, white obverse and a pale-yellow to brilliant-yellow reverse characterized colonies of T. erinacei.	Macroconidia are rare, and they usually consisted of 2–4 cells (predominantly two-celled).Macroconidia, when present, somewhat irregular in shape and size and had two to six septa	Numerous elongated microconidia attached along the sides of the hyphae.	_	+	+
T.tonsurans	Colonies show variation in texture and colour,powdery, flat with a raised center or folded often with radial grooves.the colour may vary from pale-buff to yellow,dark-brown.reverse colour varies from yellow –brown to reddish-brown to deep mahogany.	Macroconidia occur less frequently, exhibit irregular shapes, and are somewhat thick-walled .	characteristic microconidia are clavate, tear-shaped, and often match head shaped and are formed in clusters on multiple-branched, thickened terminal hyphae. Filiform or claw-shaped conidia are arranged laterally on irregular hyphae giving the appearance of a centipede.	_	+	+
T.interdigitale	Colonies of T. interdigitale are white in colour and of cottony consistency on obverse and beige to brown on reverse.	cigar shaped macroconidia and spiral hyphae	branching septate hyphae with numerous sphericial microconidia arranged in grape-like clusters.	+	+	+
T. schoneninii	colonies characterised by swollen, antler-like hyphae and abundant chlamydospores .	Without macroconida	without microconidia .	_	+	+
T.quinckeanum	Coloneis are flat or slightly raised and folded,white to cream,suede like in texture with a pale yellow –brown to pinkish brown reverse.	The macroconidia abundantly produced after 2 weeks of cultivation. They are thin-walled, formed at the end of hyphae or poorly differentiated conidiophores, rarely intercalary, cigar-shaped or clavate, 39–57 × 4.5–8 µm, usually consisting of 4–8 cells (2–9 cells; median, 6). Spiral hyphae are present, more abundant in several-week-old cultures .	The microconidia pyriform to clavate, sized 2.5–5.5 × 2–3.5 µm, and borne sessile on conidiophores poorly differentiated from vegetative hyphae or conidiophores branched in a pyramidal fashion with central branches tapering toward the tips.	+	+	+
Microsporum canis	Velvety white colonies with the reverse showing yellow to orange pigmentation when grown in vitro on most mycological media.	microscopically, it presents fast-growing and numerous spindle-shaped macroconidia, with thick, rough cell walls with septations that can vary from five to nine .	Microconidia ,when present are sessile and vary in number, but they have no diagnostic value.	+	+	_
M.gypseum	Growing flat powdery beige colonies with brownish red reverse after ten days.	Symmetrical,ellipsoidal,thin-walled,verrucose,four to six ceeled macroconidia.	Numerous clavate shped microconidia are also present.	_	+	+
Epidermophyton floccosum	White flat colonies; subsequently, the middle raised and folded in the center, with a flat periphery and submerged fringe of growth. Colonies are usually slow-growing, greenish-brown with a suede-like. Older cultures may develop white pleomorphic tufts of mycelium. A deep yellowish-brown reverse pigment is generally present.	Microscopic morphology shows characteristic smooth, thinwalled, usually macroconidia, which are often produced in clusters growing directly from the hyphae.	Microconidia are not produced	+	+	+

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Dermatophytoses are superficial mycotic diseases caused by pathogenic dermatophytes. The frequency of anatomical infections may vary according to geographical location and/or the quality of the surrounding environment[8,9] Tinea pedis, on the other hand, is the most widespread kind of dermatophytosis figure 6. Although tinea is not potentially fatal, it can be very bothersome. It takes specialized equipment and skilled medical personnel to positively identify a case of dermatophytosis [10]. Therefore, appropriate diagnostic techniques must be used to provide an accurate diagnosis and subsequent therapy. Traditional laboratory methods and modern molecular techniques can both be used to diagnose fungi. In all cases, the text advocates for the use of more advanced molecular diagnostic methods despite the fact that these tools are not always readily available or economical [10]. Therefore, direct KOH microscopy has become a common diagnostic tool. Several countries advocate for the use of direct microscopy and culture as approaches [7] showed in table 3.

Particularly prevalent in the world's tropical and subtropical regions, where the warm and humid climate is suitable for fungal growth [11] dermatophytosis is a widespread health issue overall. A growing number of kids, teens, and adults are getting sick from them.

When comparing the prevalence of dermatophytosis between the sexes, this study discovered that males have a higher prevalence than females. This matched the results found by Leiva-Salinas [12] who studied the incidence of dermatophytosis among school-aged children in a rural area of southern Ethiopia and found that the rate was 42.2% among men and 30.5% among females. [13] found the opposite, reporting a higher frequency of dermatophytosis in girls (51.4%) than in boys (41.5%) among school-aged children in the Nok village of Kaduna State, Nigeria.

Numerous reasons cause negative results in direct microscopic examination such as the collection of a small amount of the sample which makes it insufficient to give a positive result, the position of the sample taken from the central part of the affected area, which may have gained local immunity, so it is free from skin fungi [14] While the reasons cause negative results in culture may be due to the patient using topical treatments randomly and without consulting a specialist doctor [15,16]. The reason is an error in the method of storing the sample until culturing, as it is stored in containers that retain moisture, which helps in the growth of saprophytic fungi that contaminate the original sample upon cultivation, and then the lack of a positive result of cultivation. The rapid growth of saprophytic fungi on the culture medium prevents the growth of dermatophytes even when grown on culture media containing cycloheximide [6]

The lack of checklists and documentation of fungal data is a significant knowledge gap when it comes to the diversity of fungi in Iraq. There have been no mycological bibliographic studies or updated checklists for fungi in Iraq.

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CONCLUSION

Although Covid 19 pandemic the world went through fundamental changes by increasing the level of understanding and awareness of people to use different sterilizers and detergents. In addition to reducing contact between people and taking care of personal hygiene. Unfortunately, these procedures did not have a positive effect on reducing dermatophytosis infection in Musayyib General Hospital. The main reason for an increase in the percentage of infections may be due to the fact that the collection area is located in an uncivilized area and lacks health expertise. This study concluded that the prevalence of dermatophyte infection with Tinea capitis in males, whose age was less than or equal to ten years more than frequent in females. Also, there is an inverse relationship with temperature season, as when the temperature is higher, the infection rate is low.

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Conflict of interests.

There are no conflicts to declare**.**

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الخلاصة

المقدمة

الفطريات الجلدية هي فطريات محبة للقرنية تعتبر كائنات خارجية، وتسبب التهابات خطيرة في الجلد والشعر والأظافر. الهدف الرئيسي من الدراسة الحالية هو تقديم مسح للإصابات الجلدية الفطرية في مستشفى المسيب العام لمحافظة بابل العراق، من خلال التعرف على نسبة الإصابة ببعض أنواع السعفة ومدى انتشارها في مختلف الفئات العمرية.

طرق العمل

أ256 مريضًا يشتبه سريريًا في إصابتهم بالفطريات الجلدية، وكان 210 منهم إيجابيين في الفحص المباشر و/أو الزرع. من عينة المرضى الإيجابية التي تشمل قشور الجلد وشظايا الشعر والأظافر.

النتائج

أظهرت الدراسة الحالية أن مرض الفطار الجلدي يصيب الذكور أكثر من الإناث بنسبة 151 (71.90%) ذكر و 59 (28.09%) إناث. ظهرت أعلى نسبة إصابة بسعفة الرأس عند الذكور، بينما أقل نسبة إصابة بسعفة الظفر وبنسبة متساوية بين الذكور والإناث. حسب الفئات العمرية.

الاستنتاجات

ووفقا لنتائج الدراسة، فإنه على الرغم من جائحة كوفيد 19، إلا أن العالم مر بتغيرات جوهرية من خلال زيادة مستوى الفهم والوعي لدى الناس لاستخدام المعقمات والمنظفات المختلفة. بالإضافة إلى تقليل المخالطة بين الأشخاص والاهتمام بالنظافة الشخصية. ولسوء الحظ، لم يكن لهذه الإجراءات تأثير إيجابي على الحد من الإصابة بالفطار الجلدي في مستشفى المسيب العام

الكلمات المفتاحية: الفطريات الجلدية، مسببات المرض، عدوى الجلد، عدوى سعفة