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Diagnostic, Survey Study of Fungi Isolated From Tinea Capitis In Baghdad City

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Abstract :

The aim of this study was to identify the dermatophytes isolated from Tinea capitis patients in Baghdad. Fifty (50) specimens were collected (hair fragments and skin scrapings) were taken the from scalp of out-patients attending the Dermatology unit of Baghdad Teaching Hospital, during the period from 2020 to 2021, In addition, 100 specimens were collected from primary school pupils from different regions in Baghdad governorate, including countryside and city center areas.". The specimens were examined directly with KOH(10%) under a light microscope to observe the fungal elements and conidia, and then cultured on Sabouraud's dextrose agar. Seven fungal species were isolated, belonging to the genera *Microsporum* and *Trichophyton* . Results show that *Trichophyton mentagrophytes* has chemical and physiological characteristics that enable it to penetrate the hair. *Microsporum gypseum* and *Trichophyton schoenleinii* have the ability of producing red pigments when growing on cornmeal agar with trypan blue. The results showed that the scaly type of Tinea capitis was the dominant clinical form compared to the Kerion type, according to the association between clinical types of Tinea capitis and the isolated dermatophytes , Zoophilic fungi predominated among fungal skin infections in relation to the regions inhabited by the patients with Tinea capitis . The incidence in rural areas was higher (66.08%) compared with urban areas (33.91%).

Keywords: Fungal infection, Dermatophyte, Tinea capitis .

دراسة تشخيصية للفطريات المعزولة من سعفة الرأس في مدينة بغداد

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مستخلص:

هدفت الدراسة الى تشخيص الفطريات الجلدية المعزولة من سعفه الراس من مرضى محافظة بغداد اذ تم جمع 50 عينة من جذور الشعر والبقايا الجلدية من فروة راس المرضى الخارجيين المترددين على وحدة الامراض الجلدية في مستشفى بغداد التعليمي خلال الفترة 2020- 2021 بالإضافة الى جمع 100 عينة من تلاميذ المدارس الابتدائية من مناطق مختلفة من المحافظة شملت مناطق الريف ومركز المدينة . شخصت العينات مباشرة بواسطه المجهر باستخدام محلول هيدروكسيد البوتاسيوم ٪10 لملاحظه البقايا الفطرية والكونيديات بعدها تم زراعتها على وسط السبرويد دكتروز اكار شخصت سبع اجناس فطرية من بينها فطر *Microsporum* و *Trichophyton*. كما بينت النتائج ان فطر *Trichophyton mentagrophytes* له صفات كيميائية ووظيفية تجعله يخترق الشعر. كما ان فطري *Microsporum gypseum* و *Trichophyton schoenleinii* لهما القدرة على انتاج صبغة حمراء اللون عند نموهما على وسط اكار الذرة. كما بينت النتائج ان النوع المتقشر من سعفة الرأس كان سائدا بالمقارنة مع نوع الفطريات المصاحبة ,Kireon وذلك للعلاقة السائدة بين فطريات سعفة الراس والفطريات الجلدية. للحيوانات كان لها ارتباط وثيق بين فطريات الجلد وسعفة الراس والمناطق المؤهلة بالسكان اذ سجلت المناطق الريفية نسبه عالية وصلت 66.08 ٪ مقارنة بمناطق المدينة التي أعطت نسبة 33.91 ٪ .

الكلمات المفتاحية : الإصابات الفطرية ، الفطريات الجلدية ، سعفة فروة الرأس.

Introduction

The first foray into Medical Mycology occurred two centuries later, in1839, when Schoenlein, a Swiss physician, discovered the fungus that causes Tinea. (Al-Khazaali,2005). Over 100 years of research has uncovered more than 100,000 species of fungi, mostly are non-pathogenic, saprophytic, yeast-like or filamentous microbes found in soil, a few have evolved to be true pathogens and are able to actively infect, cause harm and be transmitted from one susceptible host to another (Al-Janabi,2006). With the possible exception of a few dermatophytes, none of this group is an obligate parasite and most are misplaced soil saprophytes. the dermatophytes are frequently contagious, and man may serve as a disseminator of the species (Andres et al,. 2019 and Al-Juboury,2007).

Dermatophytes are a genus of closely related fungus that may enter and generate dermatophytes in the keratinized tissue of humans and some animals., which is limited to stratum corneum and elicit a number of infections (Fernandes et al.,2003). In recent years, the prevalence of dermatophytes has risen, particularly in immunocompromised individuals. (Ghannoum et al.,2004). Tinea capitis is a dermatophyte-caused fungal infection of the scalp. Infected head hair, brows, and eyelashes are also possible. As observed in *Trichophyton rubrum* infection, the skin can get infected on its own. Hair infection can take three different types.In the endothelium type, the infection begins by infiltrating the hair, after which the organism develops the hair's main inner axis asthe typical causative agent (Spiliopoulou et al., 2015). This organism causes the lining pattern to expand, but not the joint. Instead, channels inside the hair shaft develop. When the afflicted hair is submerged in a liquid, air bubbles flow along these channels, which is diagnostic. In addition to the clinical look of the scapula, this later phase of infection is known as Tinea favosa, or favus (Kao,2005). Ctothrix is a kind of hair infection that starts in the lining and spreads outside through the hair cuticle (the outer wall of the hair) to develop a mass of arthroconidia in and around the hair shaft. *Microsporum canis* is the most common caus-

al agent (Kuzucu,2005) . Aim of the study is to investigate skin infections, especially tinea capitis, in Baghdad city, particularly in primary schools, and to compare the results between rural and urban areas.

Material and Methods

Sample collection: The study group is selected from patients with skin disease attending Baghdad Teaching Hospital and Schools located in Baghdad governorate, (150) patients were included in this study from 2020 to 2021, the clinical presentation was made by a dermatologist.

Mycological investigation: Mycological investigation was carried out for all patients ,the investigation was performed by taking specimens (hair and skin scrapings) using sterilized tools after disinfecting the area with 70 % a alcohol. The specimen was divided into two parts: one part was examined immediately under microscope for direct examination, the second was usually collected on sterile filter paper in a sterile Petri dish and then transferred to the laboratory for culturing.

Direct Examination: Hair and scale specimens were exposed to direct inspection by mounting them on a clean slide with a drop of 10% KOH and covering them with a coverslip. Then the slide warmed gently (but not to boiling) and examined under the microscope looking for hyphae and spores. (sheikh etal ;2017 and Al-Hamadani, 1997).Microscopic identification of the positive pure culture was made by using slide culture technique (Al-Rawy,2000).

physiological and biochemical tests: Hair perforation test is useful in differentiating between *Trichophyton rubrum* from *Trichophyton mentagrophytes* . Short strands of human hair were autoclaved in a Petri dish containing 20 ml of distilled water After that, 2-3 drops of sterilized yeast extract (10%) were applied to the Petri dishes. The Petri plate was then filled with little fragments of the test fungus growing on SDA. After that, the plates were incubated at 28±1°C. The hair strands were subsequently mounted in lacto phenol cotton blue for 4 weeks and evaluated at regular intervals. (Al-Hamadani, 1997).

The growth at 37°C: This test was

used to distinguish genera that were related to the genus. Trichophyton which are able to grow at temperature 37ºC as *Trichophyton verrucosum* and *Trichophyton mentagrophytes*, from other genera like *Trichophyton schoenleinii*. can not be able to grow at this temperature (Hay ,2017 and Tilton, 1992).

Urease test : This test is useful for differentiating *Trichophyton mentagrophytes* from the rest of the species. Slopes of urea's agar base were infected with the tested organism and incubated at 28±1oC for 3-7 days before being evaluated. When you get a positive result on this test, the medium turns pink instead of yellow. (Kwon-Chung and Benntt,1992).

Trichophyton agars : To test the requirement of Trichophyton species to vitamins was used as basal medium. And the basal media without additives were used as controls. The series of Trichophyton agar No. 1, 4 were prepared in slants , then inoculated with the *Trichophyton spp*. , and incubated at 28±2ºC for 7-14 day . (Kown-Chung and Benntt, 1992).

Corn meal agar with tween 80 and trytpan blue : This medium was prepared by dissolve 17 gm corn meal agar powder in 1000 ml Distilled water and than added to each 100 ml, 10 ml tween 80 , and according Fobers et al.,(1998). Then added 1 gm from krypton blue and determined pH=6.8 , then sterilities of medium . This medium was used to examine the ability of M.Shoenleinii to produce red stain.

Bromo Cresol Purple Casein Yeast Extract Agar (BCPCYA) : This medium is used to differentiation between genera of dermatophytes which isolated (Kane and Smitka,1978).

Statistical analysis: The results were analyzed statistically and the rates were evaluated based on the LSD test at the level of Probability 5 %.

Results and Discussion

Chemical and physiological characteristics of isolated fungi

Results of chemical and physiological characteristics to diagnose different species, summarized in table (1). Results of hair perforation test prove that *T. mentagrophytes* has the ability to penetrate the hair. Using urea test differentiated between *T. mentagrophytes* and *T. Schoenleinii* . by pro-

Table (1) physiological and biochemical characteristics of the isolated fungi.

The fungi Isolated	Test Perforation Hair	Test urea	Medium corn Meal Agar with Tween 80 And trytpan Blue	Improvement The growth In different temperature		Change Ph medium BCPCYA When growth	Medium Trichophyton Agar NO. 1,4
				28 °c	37 °c		
Trichophyton mentagrophytes	+	+	-	-	+	+	+ 1,4
Trichophyton verrucosum	-	-	-	+	+	-	-
Microsporum gypseum	-	-	+	-	+	-	-
Microsporum audouinii	-	-	-	+	+	+	-
Trichophyton schoenleinii	-	-	+	+	-	-	+ 1,4

ducing urease enzyme to analyze the urea changing the media color, *M. Gypseum* and *T. Schoenleinii* has the ability of producing red pigments when growing on corn-meal agar with trypan blue as well as growth on PDA, *T. mentagrophytes* and *M. Audouinii* had the ability of changing the pH toward the base on BCPCYA medium , in addition to the use of Trichophyton agar no.(1,4) as media for diagnose Trichophyton genus(Dequan et .al , 2019).

Table (2) Species of dermatophytes isolated from patients with Tinea capitis.

Species Dermatophytes Isolated	Clinical types				sumati on	percent age
	Scaly type		Kireon type			
	Number	Percentage	Number	Percentage		
Trichophyton mentagrophytes	33	19.29	12	7.01	45	26.31
Trichophyton verrucosum	28	16.37	10	5.84	38	22.22
Microsporum gypseum	19	11.11	6	3.50	25	14.61
Trichophyton rubrum	17	9.94	0	0	17	9.94
Microsporum audouinii	13	7.60	0	0	13	7.60
Trichophyton schoenleinii	11	6.43	0	0	11	6.43
Trichophyton soudanense	9	5.26	2	1.16	11	6.43
Total	130	76	30	17.51	160	93.54

The relationship between Tinea capitis clinical forms and dermatophyte

The results indicated the presence of two clinical types of Tinea capitis related to fungal species which caused the infection table (2).It had been shown through this study two clinical types of, the first type of Scaly 130 (76 %), and the second was Kireon type 30 (17. 51%). (Mohamed,2019).

The results showed that the scaly type of Tinea capitis was a dominant type on Kireon type , the result agreed with what the reached of (Yu et al., 2004) the scaly type was dominant on Kireon type. And in contrary with the findings of the Kasai (2000), where was the Kireon type dominant on the Scaly type , while Mahmoud (2000) has noted that the infection of Tinea capitis from the scaly type was similar to the rate of the Kireon type.Tinea capitis infection from the scaly type appear as patches of paint covered with light dandruff, the hair is easy to remove in the affected area, and become gray color and may cut or fall from the close proximity of the scalp, Tinea capitis of the Kireon type, the infection area appears swollen and surface winding, characterized by transparent liquid like pus(Delost,2014).

It had been shown from the table that most cases of scaly type were caused by T. mentagrophytes and this was agreed with (Besbes et al; 2003). But disagreed with (Hassan, 2007),While reached Ali (1990) to that *T. verrucosum* was caused of most cases for Tinea capitis from kireon type.

This study showed that the fungus *T. verrucosum* of animal origin may cause Tinea capitis from scaly type and the inflammatory type which it caused , to agree with what mentioned

Emmons et al.,(1977), that fungi of animal origin only cause inflammatory reactions in the host. This study showed that the most of fungi isolated belong to human origin(Anthropophilic) caused Tinea capitis from scaly type and this was agreed with Hassan,(2007), that the fungal infections caused by dermatophytes of human origin rarely cause an inflammatory response in the host, as well as , being less able to cause a strong response of delayed type hypersensitivity (DTH), this arguments indicate to find of some strains of dermatophytes were the source of human have the capability to produce Mannan, it was compound of Glycoprotein, a compound found in fungal cell wall and works on the inhibition of inflammatory response especially in people exposed to immunity curb (Khalifa,1990) showed that the human fungi cause inflammation simple and chronic infection, especially among people who suffer from chronic diseases, that

had them inhibition in immune response(Raed ,2020)

The link between fungal skin infection sources and tinea capitis-affected places of residence

There was no significant difference between the sources of dermatophyte infection and the areas of infection at the probability level ($P > 0.05$) between the sources of dermatophyte infection and the areas of infection Table (3).

Human-created fungi Anthropophilic interactions between humans have a role in dermatophyte transmission, according to Verma's finding (1978). Which showed that dermatophytes infection spreads in crowded locations, especially in those who are sick, and that animal husbandry plays a significant role in infection. (Prockachi, 1970). The findings revealed that zoophilic fungus are the most prevalent, which is consistent with the findings of both studies. (Hassan, 2007), but this result disagreed with what reported by Fathi and Al- Samarai (2000) .As a result, the number of animal and human fungus is about equal.The present outcomes were incongruent with the previous ones.(Feuilhade and Lacroix,

Table (3) shows the link between fungal skin infection sources and tinea capitis-affected areas of residence.

	Zoophilic		anthropophilic		Geophilic		summation	percentage
	The number	percentage	The number	percentage	The number	percentage		
Rural region	72	42.10	23	13.45	18	10.52	113	66.08
Urban region	35	20.46	16	9.35	7	4.09	58	33.91
Total	107	62.56	39	22.80	25	14.61	171	100

2001; Hay et al; 2001) They concluded that human anthropophilic fungi are superior to Zoophilic animal fungi, hair loss and bumps containing dermatophyte spores are two ways the disease is spread: directly through direct touch or indirectly through hair loss and pimples containing dermatophyte spores. In order to diagnose the fungus that cause the sickness, it's crucial to understand how the illness spreads. (Wijdan ,2020 and Rinaldi, 2000). The rural areas recorded the highest infection rate (66.08%), while the urban areas recorded the rate of (33.91%), and this result was consistent with what was obtained. (Hassan, 2007). The results of the study were inconsistent with those of (Fathi & Al-Samarai, 2000; Fuller et al., 2001),The reason for the results of this study is that many rural areas suffer from poor health, low standards of living, and overcrowding of the population inside and outside the home. (Yehia, 1980).According to a research done in Egypt, fungal skin diseases in rural regions are caused by the animal races Zoophilic and Geophilic, and this can occur as a consequence of direct dermatophyte transmission through interaction with people and animals by coming into touch with contaminated soil through skin scales and hair shed by animals, as well as soil containing dermatophyte spores. (Al shimaa et .al; 2015 ; Amer et al., 1981).

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