Tinea capitis in Iraq: laboratory results

H.I. Fathi1 and A.M. Al-Samara1,2

Abstract A school survey of 4,461 primary-school children was carried out in which 204 cases of tinea capitis were clinically diagnosed. All cases were cultured and examined microscopically in order to compare the validity of the two methods. Microscopy detected 92 positive cases (45.1%), whereas culture detected 105 cases (51.4%). We also isolated and identified the species causing tinea capitis in our sample. These included Trichophyton verrucosum (38 cases), T. rubrum (22 cases), T. mentagrophytes var. mentagrophytes (12 cases) and T. tonsurans (11 cases). Our results are compared with other studies.

La teigne du cuir chevelu en Iraq: résultats d’examens de laboratoire

Resume Une enquête scolaire a été menée auprès de 4,461 écoliers du primaire, au cours de laquelle 204 cas de teigne du cuir chevelu ont été diagnostiqués cliniquement. Des cultures et un examen microscopique ont été effectués pour tous les cas afin de comparer la validité de ces deux méthodes: 92 cas positifs (45,1%) ont été détectés à l'examen microscopique et 105 cas (51,4%) à la mise en culture. Nous avons aussi isolé et identifié les espèces responsables de la teigne du cuir chevelu dans notre échantillon. Celles-ci étaient notamment Trichophyton verrucosum (38 cas), T. rubrum (22 cas), T. mentagrophytes var. mentagrophytes (12 cas) et T. tonsurans (11 cas). Nos résultats sont comparés à ceux d'autres études.

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Introduction

Tinea capitis can be caused by any one of several of the dermatophytes belonging to the genera Trichophyton and Microsporum; the genus Epidermophyton is not known to invade the hair [1]. The fungi most frequently causing tinea capitis are T. tonsurans, M. audouinitii and M. canis. The first two are spread from human to human, whereas M. canis is caught from animals such as cats and dogs [2]. M. ferrugineum and M. gypseum may occasionally cause ringworm of the scalp but the endothrix type such as T. tonsurans (blackdot ringworm) and T. violaceum are the most frequent invaders of the scalp [7–3]. Pipkin was among the first to recognize that T. tonsurans was beginning to replace M. audouinitii in tinea capitis epidemics in the 1950s. Several other authors also found that T. tonsurans was becoming more common in scalp ringworm [3]. Arnold et al. reported that while T. tonsurans regularly affected adults (chiefly women), dermatophytes were almost always confined to children [2]. The endothrix fungi found most frequently on the scalp and the main cause of kerion are T. verrucosum and T. mentagrophytes. Infection with T. schoenleinitii, a relatively common dermatophyte in the Middle East, also occurs in South Africa and Greenland [1,3–6]. The classical presentation of tinea capitis due to this organism is known as favus. Although the initial infection is probably nearly always contracted in childhood, it shows little, if any, tendency to clear up spontaneously at puberty and families with several generations affected are often found [2,3,7].

The limited community-based epidemiological studies that have been conducted in Iraq have shown that dermatophytosis is the third most common infection encountered by dermatological practices after pyogenic and eczematous dermatoses. Akrawi and Rassam (1962) observed that the majority of cases of scalp infections were caused by Trichophyton, especially T. violaceum and T. schoenleinitii and that Microsporum infections were uncommon [8]. Rahim (1966) observed that ringworm of the scalp continued to be a public health problem in Iraq; the main species isolated in his study were T. schoenleinitii, T. violaceum and T. mentagrophytes [7]. In later studies, Junaid and Rassam (1974) and Gumer and Guirges (1978) found that T. schoenleinitii was the main cause of infection and that Microsporum species were rarely encountered [9,10]. Yehia (1980) reported that tinea capitis was the second most common clinical type of dermatophytosis, followed by tinea corporis, with T. schoenleinitii, M. ferrugineum and T. verrucosum being the main species causing tinea capitis [5]. In Basra, the main cause of tinea capitis has been reported to be M. canis, (83.3% of cases), followed by T. violaceum and T. verrucosum [11]. Al-Mosawi et al. found that 5% of apparently healthy children were carriers of dermatophytes in their scalp and the main species isolated was T. mentagrophytes [12].

As there have been no extensive studies on the epidemiology of tinea capitis among primary-school children in Iraq, we assessed the validity of microscopical examination tests in relation to the culture method of examination and isolated and identified the species causing tinea capitis in a community field-based study.

Subjects and methods

Study population

Two groups of schools were chosen; the first group from urban areas and the second from differing rural areas in the vicini-
ty of Tikrit. Three boys’ schools, three girls’ schools and two large mixed schools were randomly selected from five urban areas of Tikrit (Al-Meddar, Al-Asry, Al-Gameya, Al-Askary and Al-Kadiseya). Six schools from four rural villages were chosen; one boys’ school and one girls’ school from Al-Door (chosen because the area had overcrowding), a boys’ school and girls’ school from Mekishfa and mixed schools from both Owenate and Albo-Ageel (all three areas chosen because of their poor water supply). Data were collected between September 1994 and April 1995.

The children studied were schoolchildren aged between 6 years and 16 years. All the students in each school were examined. The entire scalp of each child was thoroughly examined for evidence of scaling, crusting, follicular inflammation, hair loss or erythema. Other parts of the body (nails, hands, chest and legs) were examined for any evidence of scaling or erythema. In each clinically diagnosed case of tinea capitis, a detailed history was recorded. Information noted was: disease duration, home address, socioeconomic status and the level of crowding at home. Students were questioned about their use of soap and the existence of potentially contagious contacts (including contact with animals and the history of certain practices such as sharing towels, combs and hats). Family history was recorded and personal hygiene taken into consideration.

Sample collection
In all suspected cases, hair and scales were collected for mycological examination by a conventional technique. Scale scrapings were collected from at least two areas with a number 15 sterile surgical blade and approximately twelve hair stumps (roots) were pulled out with sterile epilator forceps. Both hairs and scales were placed in a clean, labelled envelope and sent to the laboratory for investigation.

Laboratory procedures
Three or four hairs were mounted on a clean slide in a drop of 25% potassium hydroxide solution with Parker ink, then covered with a 22 × 22 mm cover slip. The slide was heated gently for a few seconds to digest the keratin and clear the fungal elements. The slide was examined under low and high lens magnification for the presence of spores and/or hyphae and their distribution pattern (ectothrix, endothrix or favic type). The size and distribution of spores on the hair can provide information about the species of dermatophyte.

All samples from suspected cases were cultured irrespective of the negative or positive examination result. Each sample was cultured on two plates of Sabouraud agar, one with penicillin and streptomycin or chloramphenicol and cycloheximide, and the other with penicillin, streptomycin or chloramphenicol.

The agar was inoculated by transferring some of the hair stubs and scales to the surface of the medium using a sterile straight loop and forceps. The inoculated plates were then incubated for 4–6 weeks at 28–30 °C, except in cases of suspected infection by T. verrucosum when it is best accomplished at 37 °C. The cultures were examined periodically for evidence of growth. Negative or contaminated plates were repeatedly reinoculated until a positive finding was established. After the growth of the dermatophytes was established, a subculture was made on Sabouraud dextrose agar for further identification.

Identification
Species were identified using a conventional method which emphasized colony morphology, microscopy and other
miscellaneous tests. Cultures were examined macroscopically for morphology, texture and colour from the top and reverse side of the plate. Then using a sterile straight loop the colony was examined by placing a sample on a drop of lactophenol solution on a clean glass slide. The matted mycelial mass was teased or separated with dissecting needles to facilitate microscopical observation. The preparation was then covered by a cover slip (22 × 22 mm) and examined under the microscope for the presence of microconidia, macroconidia and other structures. Every positive growth obtained was subcultured on two Sabouraud plates, one with added yeast and the other with added sodium chloride. The inoculated plates were incubated for 2 weeks at 28 °C to further stimulate the chlamydospores. After identification was completed the plates were kept refrigerated at 4 °C for a maximum period of 1 month.

In vitro hair perforation by certain dermatophytes was used for further species identification. This test was used to differentiate certain species of *T. mentagrophytes* which can penetrate hair in vitro from *T. rubrum* which cannot. This simple procedure involved the use of baby hair in Petri dishes to which 25 mL of sterile distilled water and 2–3 drops of 10% sterilized yeast extract were added. Several colony fragments served as inoculum and the inoculated dishes were incubated in the dark at 25 °C. After 3 weeks of incubation, hair segments overgrown with mycelium were removed from the dishes with sterile forceps, placed in a drop of lactophenol cotton blue mounting fluid and examined under the microscope. Penetrated hair segments were identified by wedge-shaped perforations.

Corn meal agar tests and potato dextrose agar tests were used to differentiate *T. rubrum* and *T. mentagrophytes*; the first showing deep pigmentation and the second no pigmentation.

**Results**

Of a total of 4461 students, 2333 were from urban areas and 2128 from rural areas; 2364 were male and 2097 were female. Of these, 204 children (126 males and 78 females) were provisionally diagnosed with tinea capitis. Mycologically proved infection was found in 120 cases, 82 male and 38 female. The overall prevalence rate was 2.7%; the urban prevalence rate 2.4% and the rural rate 3.0%. The rate for males was 3.5% and for females 1.8%.

Of the 120 proven cases, 15 (12.5%) were found to be positive by direct microscopic examination only, 28 (23.3%) by culture only and 77 (64.2%) positive by both techniques (Table 1). Culture methods detected 105 cases (51.4%) among the 204 provisionally diagnosed children, while the microscopic method revealed only 92 positive cases (45.1%). The sensitivity and specificity of direct microscopical examination to culture examination was 73.3% and 84.8% respectively. The positive predictive value was 83.6% and the negative predictive value 75.0% (*P* < 0.05).

Among the isolated dermatophytes, *T. verrucosum* was the predominant species, found in 38 cases (36.2%), followed by 22 cases of *T. rubrum* (20.9%), 12 of *T. mentagrophytes* variant *metagrophytes* (11.4%), 11 of *T. tonsurans* (10.5%), 8 of *M. audouinii* (7.6%), 5 of *T. mentagrophytes* variant *interdigitale* (4.8%), 3 of *T. violaceum* (2.9%) and 6 cases (5.7%) which were unidentified. Of all the identified dermatophytes, 50 (47.6%) were zoophilic and 49 (46.7%) were anthropophilic (Table 2).
Table 1 Results of direct examination of the cultures of 120 cases of tinea capitis

<table>
<thead>
<tr>
<th>Culture</th>
<th>Direct examination</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Positive</td>
<td>77</td>
<td>28</td>
</tr>
<tr>
<td>Negative</td>
<td>15</td>
<td>84</td>
</tr>
<tr>
<td>Total</td>
<td>92</td>
<td>112</td>
</tr>
</tbody>
</table>

We observed that *T. verrucosum* was the slowest growing dermatophyte and *T. rubrum* the fastest. The association between the cultures isolated and the clinical variants of tinea capitis are shown in Table 3. Most of the species isolated were of the seborrhoid type, including all cases of infection with *T. rubrum*. The condition known as grey patch was the result of infection with *T. verrucosum* and *M. audouinii* and kerion was caused by *T. verrucosum* and *T. mentagrophytes*. All cases of black dot were caused by *T. tonsurans* and favus mainly caused by *T. violaceum* infection. The distribution of species by urban and rural residence and according to sex is shown in Table 4. Zoophilic species (*T. verrucosum* and *T. mentagrophytes var. mentagrophytes*) were mainly isolated in rural areas. In contrast, anthropophilic species, (*T. rubrum, M. audouinii, T. mentagrophytes var. interdigitale* and *T. violaceum*) were predominantly isolated in urban areas. *T. tonsurans* was the only zoophilic species encountered in rural areas.

**Discussion**

The initial diagnosis of tinea capitis may depend on clinical features. However, clinical judgement alone is unsatisfactory since frequent mistakes in clinical diagnoses result from cases of dermatoses that mimic tinea capitis clinically. In our study, 120 positive cases were detected by mycological methods, only 58.8% of the total suspected cases. Out of these 120 cases, 15 (12.5%) were incompletely identified because of a negative culture growth. The possible reason for negative culture growth from microscopically positive samples may be that highly contaminated samples were grown over by fast growing saprophytic species which prevented the growth of dermatophytes even on a medium with cycloheximide [13]. On the other hand, our finding of 28 (13.7%) positive cases with negative results from direct examination and positive culture results has also been observed by others [3,5]. Munro suggested that the hair shaft may be obscured by melanin granules in black-haired patients leading to negative microscopical findings, (FM Munro personal communication. 1995). Eighty-four
Table 3 Clinicoetiologic correlation in cases of tinea capitis

<table>
<thead>
<tr>
<th>Type of Infection</th>
<th>Seborrhoid</th>
<th>Grey patch</th>
<th>Clinical type</th>
<th>Black dot</th>
<th>Favus</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trichophyton verrucosum</td>
<td>29</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>38</td>
</tr>
<tr>
<td>T. rubrum</td>
<td>22</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>T. mentagrophytes</td>
<td>14</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>T. tonsurans</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Microsporum audouinii</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>T. violaceum</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Unidentified</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Total no. (%)</td>
<td>79 (75.2)</td>
<td>12 (11.4)</td>
<td>6 (5.7)</td>
<td>5 (4.8)</td>
<td>3 (2.9)</td>
<td>105 (100)</td>
</tr>
</tbody>
</table>

Table 4 Distribution of positive culture according to sex and residence

<table>
<thead>
<tr>
<th>Type of Infection</th>
<th>Urban area Male</th>
<th>Female</th>
<th>Rural area Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trichophyton verrucosum</td>
<td>9</td>
<td>4</td>
<td>16</td>
<td>9</td>
<td>38</td>
</tr>
<tr>
<td>T. rubrum</td>
<td>10</td>
<td>3</td>
<td>7</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>T. mentagrophytes</td>
<td>9</td>
<td>0</td>
<td>7</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>T. tonsurans</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Microsporum audouinii</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>T. violaceum</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Unidentified</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>12</td>
<td>41</td>
<td>20</td>
<td>105</td>
</tr>
</tbody>
</table>

suspected cases (41.2%) gave negative culture and microscopy results. These negative results could be due to the absence of dermatophytes or to the inadequacies of the isolation technique. In such cases the presence of antifungal agents in the sample will give a negative result [3,5].

It was interesting to observe the accuracy of clinical evaluations compared with the cultural and microscopical examination results. The results should be interpreted with caution, especially as some of the children with a negative mycological result were still clinically judged to be infected. It could be concluded that culture growth is the best assessment method as the yield of fungal isolation was higher than that revealed by direct examination.

المجلة الصحية لشرق المتوسط، منظمة الصحة العالمية، المنحة السادسة، العدد 1، عام 2000
The tests used for verification identified six species from the anthropophilic and zoophilic groups. Species of the genus *Trichophyton* were responsible for the majority of cases of tinea capitis, a finding which concurs with other studies [3-5]. *T. verrucosum* causes an inflammatory mycosis seen chiefly in rural communities and although children are particularly vulnerable, several members of a family may be affected. It is believed that the most common of the *Trichophyton* species causes kerion, an inflammatory skin infection in hairy areas.

**T. verrucosum**

The most common species we found was *T. verrucosum* (36.2%). It was isolated from 29 seborrhoid cases, 6 cases of grey patch and 3 cases of kerion. The cases of kerion were detected in three Egyptian sisters in an urban school. On careful examination multiple inflammatory lesions over the occipital area were observed. They reported a history of continuous contact with rabbits and that the infection had been present for more than 6 months. Although human infection due to *T. verrucosum* is usually confined entirely to rural populations, infection in laboratory employees working with rabbits and white mice has been recorded. It would seem that the higher rate of infection among the rural population found in this study was due to cattle and other domestic animals being housed beside or within the same building as the children. Continuous close contact between humans and animals facilitates the contagion and the 13 urban cases reflect the fact that people have more contact with animals in their homes than before.

Finding *T. verrucosum* to be the main etiological cause of tinea capitis concurs with other studies. Kolemen found it to be the main cause of tinea capitis (36.1%) in Ankara and that all sources were isolated from rural areas [4]. Chadeziani et al. estimated that tinea capitis was the most common form of dermatophytoises (72.1%) and that *T. verrucosum* was the most frequent dermatophyte (43.8%) isolated from patients with tinea capitis in Isfahan [6]. In a later study in the Islamic Republic of Iran between 1986 and 1991, Kharrazi et al. isolated 472 cases of *T. verrucosum* infection from 2790 cases of tinea capitis [14]. *T. verrucosum* was the second most common organism found in the United Arab Emirates and Puerto Rico [15,16]. In Pakistan it was the third most common source of tinea capitis with lower isolation rates than those reported for the United Arab Emirates, areas in Saudi Arabia and Florence [15,17-19]. In previous studies in Iraq, Yehia [5] estimated that it was isolated in 14.3% of tinea capitis cases in Mosul, and Al-Mosawi et al. [12] isolated 4 cases of *T. verrucosum* from 20 cases of dermatophyte carriers in primary-school children in Basra. Junaid and Rassam found the prevalence of *T. verrucosum* in Baghdad to be 3.2% and Al-Hashimi’s findings in Basra were of 3.1%; both considerably lower than our findings [9,11].

Up to the mid-1970s, *T. verrucosum* was the most important dermatozoosones causing 60%–70% of tinea capitis cases. Farmers raising cattle were frequently infected but the mechanization of farming has significantly reduced *T. verrucosum* as a cause of tinea capitis [20]. Our study population, however, present a different picture as contact with cattle continues, even in urban areas.

**T. rubrum**

Trichophytosis due to *T. rubrum* is a many faceted disease characterized by a low-grade inflammatory reaction and includes
what is commonly known as chronic dermatophytoses; curing it is characteristically difficult. *T. rubrum* is considered the most common anthropophilic species worldwide found in crural pedal disease and often in *tinea unguium* [1,4,27].

In our study *T. rubrum* was the second most common etiological agent causing *tinea capitis* (20.9%). Males were three times more likely to be infected with *T. rubrum* than females and the species was predominately encountered in urban schools. The cases isolated included three Kuwaiti brothers and two Egyptian sisters. *T. rubrum* has also been reported as the second most common cause of *tinea capitis* in the United Arab Emirates (19%) and in Pakistan (21.1%) [15,17]. However, *T. rubrum* in *tinea capitis* is relatively rare worldwide, although there are reports from Germany, India, the Islamic Republic of Iran and Portugal, which document significant isolation rates [1,3,14,20].

Lower levels than ours have been reported by Woodguyer in New Zealand (2.5%), Mercantini and Moretto in Italy (1.7%) and Khoosavi et al. in the Islamic Republic of Iran (0.5%) [14,22,23]. One survey of more than 16,000 patients revealed only 139 *tinea capitis* cases caused by *T. rubrum*, and *tinea capitis* caused by *T. rubrum* does not seem to be increasing worldwide with frequencies of between 1%-10% [24].

Previous studies in Iraq have indicated an absence of *T. rubrum*, except for one study by Junaid and Rassam who reported that it constituted 1.9% of all their isolates [9].

**T. mentagrophytes**

*T. mentagrophytes* is a major type of superficial fungal infection. Like *T. verrucosum*, this fungus is associated with highly inflamed lesions and kerion-type scalp infec-

...
T. tonsurans

Tinea capitis due to the anthropophilic species T. tonsurans has become a significant health problem worldwide. It was responsible for the secondary epidemic of tinea capitis which began in the 1970s and it continues to spread [1,17,26].

In our study T. tonsurans was the fourth most commonly isolated dermatophyte, accounting for 10.5% of the total isolates. It was detected in six seborrheic cases and five cases of black dot. T. tonsurans can be found in all members of a family [26]. For example, we found eight related children from the mixed school in Owenate with chronic infection. If untreated, non-inflammatory T. tonsurans may persist for long periods of time, unlike inflammatory tinea capitis which tends to be acute but self-limiting [1].

Preliminary studies in Iraq found T. tonsurans to constitute 6.5% of cases (reported by Gunaid and Rassam) and 3.5% of cases (reported by Gumer and Guirges) [9,10]. The percentage found in surrounding countries has also been low; 2.8% in Turkey and 3.7% in the Islamic Republic of Iran [4,14]. By comparison, in the United States of America in the early 1980s, T. tonsurans was responsible for 90% of tinea capitis in Brooklyn, Charleston and Philadelphia, and for 98% of tinea capitis in Chicago [1]. Many American researchers consider that this type of dermatophyte may have spread from Hispanic immigrants to the African-American population in cities in the United States [1]. In common with other reports, we found no significant difference between males and females [1,22].

M. audouinii

M. audouinii was the only Microsporum species isolated in this study. M. audouinii was the main cause of tinea capitis epidemics in the 1940s and 1950s, typically in Caucasian boys [1]. Unlike infection with T. tonsurans, a spontaneous cure at puberty is more likely to occur with M. audouinii. In our study, it represented 7.6% of total isolates, although it has not previously been reported in Iraq. It was found to be the main cause of tinea capitis among schoolchildren in Ille Ile and M. audouinii and T. soudanense were reportedly isolated from 374 primary-school children in North and South Togo [1,3].

The fungus was identified from four typical cases of grey patch and four seborrheic cases. The male to female ratio in our study was 3:1 and the fungus was found to be more prevalent among immigrants from Egypt and Kuwait. Similarly, M. audouinii reportedly constituted 23.3% of isolated cases found among African immigrants from westem, tropical Africa [3].

T. violaceum

T. violaceum is widely distributed throughout the world and is a common cause of scalp infection [3,13,17]. This fungus has been responsible for epidemics of tinea capitis in Africa and in some areas as many as 41% of schoolchildren without symptoms are carriers and 30% of mothers show positive cultures [1]. T. violaceum was our least commonly encountered dermatophyte (2.9%); it was detected in two favic cases and one seborrheic case. It can cause favus and may appear as heavy dandruff [2]. T. violaceum has been reported in all previous studies on tinea capitis in Iraq, but was usually more prevalent. For example, the following prevalence rates have been reported: Rahim (21.3%), Junaid and Rassam (17.1%), Yehia (10.5%), and Al-Hashimi et al. (12.3%) [1,7,9,11]. Al-Mosawi et al. isolated eight cases in dermatophyte carriers in two primary schools in Basra [12]. Our findings were more in
agreement with Mercantini and Moretto who found that *T. violaceum* was the cause of 2.4% of all cases of *tinea capitis* in Rome [23]. The explanation for the low prevalence of this fungus may be attributed to its physiological characteristics. It has been found that it is difficult to obtain a characteristic colony during the winter months [3]. Certain species of dermatophytes experience spontaneous mutation, causing them to lose the ability to form conidia. This is known as a pleomorphism and occasionally these organisms may be isolated in such a condition as to make them almost impossible to identify, with only white, fluffy mycelium visible [27]. This phenomenon is not reversible [3].

**Unidentified**

Finally, in our study six isolates were unidentified. They were obtained from three seborrhoeic cases, two cases of grey patch and one favic case. Of these cases, one resembled *M. ferrugineum* and another resembled *M. canis*. However, despite repeated subculturing, we were unable to confirm these findings. Unidentified fungi have also been reported by other researchers [7,15].

**References**


5. Yehia MM. *Studies on dermatophytes in Mosul and vicinity* [Thesis]. Mosul, University of Mosul, College of Medicine, 1980-81:106.


