Epidemiology and Etiology of *Tinea Capitis* among Patients Attending Zliten Medical Center in Zliten, Libya

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السمات الوبائية والمسببات الفطرية للاصابة بسعفة الرأس بين المرضى المترددين على مركز زليتن الطبي،زليتن، ليبيا

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Abstract

Tinea capitis is a prevalent fungal infection of the scalp, affecting mainly children and potentially causing scarring and alopecia if untreated. Primarily caused by dermatophyte fungi, including Microsporum and Trichophyton species, the infection spreads through close contact, often in school settings or homes with animals. Understanding the infection's epidemiology and causative agents in specific areas can help shape preventive and treatment measures. This study investigates epidemiological features of age and gender distribution, and common fungal species causing *Tinea capitis* among patients at the Zliten Medical Center in Libya. Data were collected from 178 patients from January 2021 to August 2024, encompassing demographic details, clinical diagnoses, and diagnostic results, including Potassium hydroxide (KOH) microscopy and fungal cultures. Patients were grouped by age and gender, and diagnostic results were reviewed to identify specific fungal pathogens. Among the 178 patients, 57.3% were male and 42.7% were

female, with the highest prevalence in the 6–12 age group (47.8%), followed by ages 1–5 (37.1%). Positive results for KOH microscopy were 45.5%, and culture testing confirmed dermatophyte growth in 44.9% of cases. *Microsporum canis* was the most frequently isolated species (22.5%), followed by *Trichophyton verrucosum*.(%10.7). The findings highlight *Tinea capitis* as a pediatric condition, especially in young males, with *Microsporum canis* indicating zoonotic transmission. These results underline the importance of targeted public health initiatives and hygiene education, particularly in schools and homes with animals, to minimize transmission rates.

Keywords: *Tinea capitis, Microsporum canis, Dermatophyte infection, Pediatric infection, Zoonotic transmission, Zliten, Libya.*

الملخص

سعفة الرأس هي عدوى فطرية شائعة تصيب فروة الرأس، تؤثر بشكل خاص على الأطفال، وقد تؤدي إلى مضاعفات مثل التندب والثعلبة إذا لم تُعالج. تُعزى العدوى بشكل رئيسي إلى فطريات الجلد مثل أنواع Microsporum وTrichophyton، وتنتقل عبر الاتصال المباشر، خاصة في البيئات المدرسية والمنازل التي يوجد بها حيوانات. يهدف فهم عوامل الوباء وأسباب العدوى إلى تطوير استراتيجيات فعّالة للوقاية والإدارة في المناطق المعنية. أجريت هذه الدراسة للتحقق من انتشار سعفة الرأس وتوزيعها حسب العمر والجنس، وتحديد الأنواع الفطرية المسببة الشائعة بين المرضى في عيادة الأمراض الجلدية الخارجية بمركز زليتن الطبي في ليبيا. شملت الدراسة تحليل بيانات 178 مريضاً، تم جمعها خلال الفترة من يناير 2021 إلى أغسطس 2024، واشتملت على التشخيص السريري والفحوصات باستخدام هيدروكسيد البوتاسيوم (KOH) وزراعة الفطريات. أظهرت النتائج أن 57.3% من المرضى كانوا من الذكور و42.7% من الإناث، مع انتشار أعلى بين الأطفال من عمر 6 إلى 12 سنة (47.8%)، تليها الفئة من 1 إلى 5 سنوات (37.1%). أظهرت الفحوصات المجهرية KOH نتائج إيجابية بنسبة 45.5%، وأكدت زراعة الفطريات نمو الفطريات الجلدية في 44.9% من الحالات، حيث كان *Microsporum canis* الأكثر شيوعاً بنسبة 22.5%. تشير الدراسة إلى أن سعفة الرأس هي حالة شائعة بين الأطفال، وتبرز الحاجة إلى التوعية بالنظافة الشخصية وتطبيق التدخلات الوقائية في المدارس والمنازل التي توجد بها حيوانات.

الكلمات الدالة: سعفة الرأس، *Microsporum canis*، عدوى الفطريات الجلدية، عدوى الأطفال، انتقال العدوى من الحيوان إلى الإنسان، زليتن، ليبي

1. Introduction

Tinea capitis is a significant and contagious fungal infection of the scalp, predominantly affecting children, largely due to their close-contact environments and limited understanding of hygiene practices(Al-Sheikh, 2009). This infection, caused by dermatophyte fungi, can lead to symptoms such as scaling, hair loss, itching, and inflammation, and, if left untreated, it may progress to permanent scarring (El-Khalawany *et al .,* 2016; Hay, 2012). The dermatophytes responsible for *Tinea capitis* primarily belong to the Trichophyton and Microsporum genera, which infect keratinized tissues like hair, skin, and nails(Weitzman, 1995). In particular, *Microsporum canis* is a prevalent cause in regions where close human-animal interactions are common, as it is frequently transmitted from infected animals, while *Trichophyton tonsuran*s is another

notable causative agent (Grimalt, 2005) In the Middle East and North Africa (MENA) region, including Libya, *M. canis* is frequently reported, with infections caused by *T. violaceum* and *T. schoenleinii* documented as well (Al-Sheikh, 2009; El-Khalawany *et al*., 2016) .

Despite being among the most common dermatological infections globally, specific data on *Tinea capitis* prevalence in Libya remains scarce. However, studies in nearby regions suggest that the infection burden may be high, particularly in rural areas where exposure to infected animals and limited healthcare access increase the infection risk(Arenas, 2006; Ginter-Hanselmayer, 2007). Zliten, a city in Libya with a population reliant on agriculture and animal husbandry, may also face a high prevalence of *Tinea capitis*, although there is limited epidemiological data directly available for this area. (Organization, 2005) highlights the necessity of localized data for infectious skin diseases like *Tinea capitis* in underserved regions, where specific healthcare challenges must be addressed.

This study addresses these gaps by focusing on the prevalence and diagnostic practices for *Tinea capitis* at Zliten Medical Center, where anecdotal reports suggest a growing number of cases, particularly among school-aged children. By collecting and analyzing diagnostic data and infection patterns, this research aims to provide a comprehensive understanding of *Tinea capitis* prevalence and the effectiveness of current diagnostic methods in Zliten, contributing valuable insights to help inform broader public health strategies for managing dermatophyte infections in Libya and similar regions.

2. Materials & Methods

2.1. Area of Study

Zliten is a Libyan coastal city situated along the Mediterranean Sea, approximately 160 kilometers east of Tripoli, it has a population of 335,371 and a hot and humid climate in Summer months (Registration, 2023).

2.2. Study Objectives

This study was conducted to contribute to the understanding the Epidemiology and fungal species causing *Tinea capitis.*

2.3. Study Methods

This study was cross sectional study conducted on 178 clinically suspected cases of *Tinea capitis* across all age groups and genders, who attended the outpatient dermatology department at Zliten Medical Center. The study spanned from January 2021 to August 2024.

The collection of samples began by disinfecting the infected areas with sterile cotton swabs soaked in 70% ethanol. Lesional material was then collected by scraping the affected area with a sterile scalpel and

placing the samples in sterile, disposable Petri dishes. Samples were transported to the laboratory for analysis in sealed, sterile Petri dishes labeled with identifying information, including patient name, gender, age, date of collection, and suspected clinical diagnosis.

The samples were split into two portions: one designated for culture and the other for direct microscopic examination. For the microscopic examination, a portion of hair and scalp scraping was placed on a clean glass slide. A 10-20% potassium hydroxide (KOH) solution was applied to dissolve keratin material, the slide was covered with a cover glass, and gently heated. Microscopic examination for fungal spores and hyphae was then conducted at 10X and 40X magnification.

For culture, the samples were inoculated on Sabouraud Dextrose Agar (SDA) supplemented with chloramphenicol and cycloheximide to inhibit contamination by saprophytic fungi and bacteria. The Petri dishes were incubated at 25°C, and cultures were monitored for fungal growth every 2 to 3 days over a period of one to three weeks. Petri dishes were discarded only if no growth was observed after three weeks. In cases of fungal growth, the identification of etiologic agents was based on the gross morphological characteristics of fungal colonies, such as surface texture, color, topography, reverse pigment, colony growth rate, and microscopic features including hyphae, macroconidia type, and microconidia size and shape.

2.4. Statistical Analysis

The collected data were analyzed using SPSS version 25 to evaluate the distribution and prevalence of *Tinea capitis* infections affecting the hair and scalp.

3. Results & Discussion

This study analyzed data from 178 patients who sought dermatological care at the outpatient department of Zliten Medical Center for suspected *Tinea capitis* infection. The data includes demographic information, clinical diagnosis, and diagnostic test results, including potassium hydroxide (KOH) microscopy and culture findings. The purpose of the analysis was to evaluate the distribution of infection across age and gender groups, the effectiveness of KOH tests, and the prevalence of specific dermatophyte species causing *Tinea capitis.* Table (1)

Table 1. Demographic and Diagnostic Results for *Tinea Capitis* Cases,

Variable	Category	Frequency	Percentage (%)
Gender	Male	102	57.3
	Female	76	42.7
Age Group	1-5 years	66	37.1
	6-12 years	85	47.8
	13-18 years	13	7.3
	19-35 years	9	5.1
	35-50 years	5	2.8
KOH Test Result	Positive	81	45.5
	Negative	97	54.5
Culture Test Result	*Microsporum canis*	40	22.5
	Trichophyton verrucosum	19	10.7
	Other species	21	11.8
	No growth	98	55.1

Out of 178 patients, 57.3% were male (102 patients) and 42.7% were female (76 patients), indicating a higher incidence of *Tinea capitis* among males Figure (1).

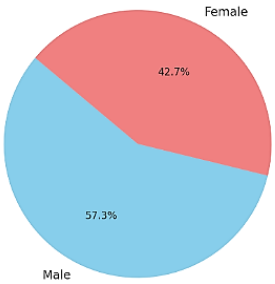

Figure 1. Gender Distribution of *Tinea Capitis* Cases Among Patients (n=178)

3.1. Age Distribution

The age groups varied, with the majority of cases (47.8%) found in the 6–12 age group, followed by the 1-5 age group at 37.1%. Adolescents aged 13–18 accounted for 7.3%, while adults (19–50) made up a smaller portion, emphasizing the high prevalence of *Tinea capitis* in children Figure (2).

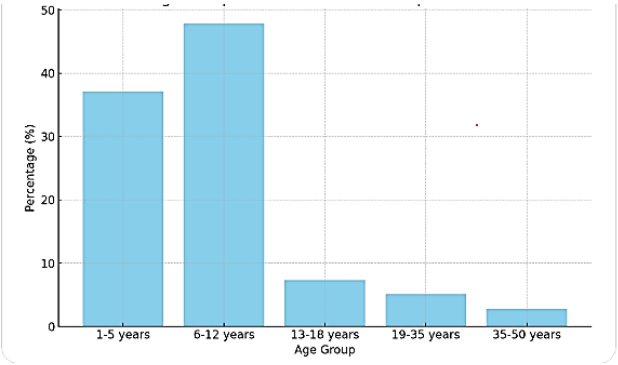

Figure 2. Age Group Distribution of *Tinea Capitis* Cases Among Patients

KOH Microscopy: KOH tests showed 45.5% positive and 54.5% negative results among suspected cases.

3.2. Culture Results

Culture testing confirmed dermatophyte growth in 44.9% of cases, with the remaining 55.1% showing no growth. *Microsporum canis* was the most frequently isolated species (22.5%), followed by *Trichophyton verrucosum* (10.7%) and other dermatophyte species in smaller percentages. Figure (3)

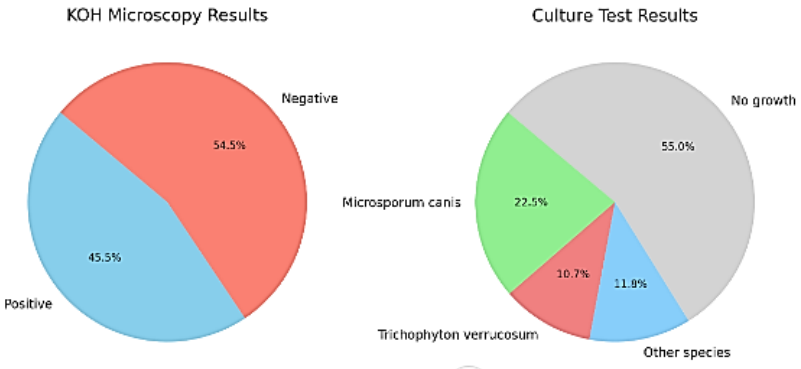

Figure 3. KOH Microscopy and Culture Test Results for *Tinea Capitis* Cases

The cross-tabulation analysis of 178 suspected *Tinea capitis* cases revealed that 45.5% (81 cases) were KOH positive, while 54.5% (97 cases) were KOH negative. Culture results showed 44.9% (80 cases) were positive for fungal growth, whereas 55.1% (98 cases) were negative. Concordance between KOH and culture was observed in 52 cases with positive results in both tests and in 69 cases with negative results in both, suggesting substantial agreement between the two diagnostic methods. In 28 cases, KOH was negative, but culture yielded positive results, indicating culture's ability to detect cases that KOH alone may

miss. Conversely, 29 cases were positive with KOH but negative in culture, highlighting KOH's utility as a rapid screening tool despite occasional discrepancies. Statistical analysis using the chi-square test revealed a significant association between KOH and culture results (Pearson Chi-Square = 22.268, p = 0.000; Continuity Correction = 20.863, p = 0.000), and Fisher's Exact Test further confirmed a statistically significant association with p = 0.000 for both two-sided and one-sided tests. These findings confirm the significant agreement between KOH microscopy and culture in diagnosing *Tinea capitis*, with culture providing additional verification in cases where KOH results may be inconclusive. Table 2

Table 2. Crosstab of KOH and Culture Results with Totals for *Tinea Capitis* Cases,

		culture result		
		Positive	Negative	Total
KOH result	Positive	52	29	81
	Negative	28	69	97
Total		80	98	178

Dermatophytes a group of pathogenic fungi; are known to cause superficial fungal infections, particularly *Tinea capitis*. This study, conducted on 178 patients who visited the outpatient dermatology clinic at Zliten Medical Center, involved the collection of samples from hair and skin scrapings of Scalp. These samples were subsequently processed, cultured, isolated, and identified in the hospital's central laboratory. The analysis of these samples revealed that direct microscopic examination using potassium hydroxide (KOH) yielded positive results in 81 samples (45.5%), while fungal culture showed positive growth in 80 samples (44.9%). Concordance between potassium hydroxide (KOH) microscopy and fungal culture. Among the cases, 45.5% (81 cases) tested positive with KOH microscopy, while 54.5% (97 cases) were negative. Fungal culture confirmed fungal growth in 44.9% (80 cases), with 55.1% (98 cases) showing no growth. Concordance between KOH and culture results was observed in 52 cases where both methods were positive and in 69 cases where both were negative, indicating a substantial level of agreement between the two methods. Discrepancies occurred in 28 cases where KOH was negative but culture was positive, suggesting culture's ability to detect additional cases beyond those identified by KOH. Conversely, 29 cases were positive with KOH but negative in culture, highlighting KOH's utility as a rapid screening method despite occasional discrepancies. These findings suggest that while KOH microscopy is an effective initial screening tool, fungal culture remains crucial for confirming infections, especially when KOH results are inconclusive

Comparative studies reveal similar findings. In previous Study in Zliten; which had investigated KOH samples from different parts of the body for suspected fungal infections; was found that 26% false

negative results for KOH in cases with suspected fungal infection, und this clearly demonstrate that KOH is more sensitive diagnostic tool for *Tinea Capitis*. (Arshah *et al.,* 2019). As well, a study conducted in Bangladesh found KOH smear positivity in 32.8% of samples and culture positivity in 30.3% of cases, with 25.9% showing concordance between the two methods. These results underscore the importance of combining direct microscopy and culture for accurate diagnosis (Rahman, 2019).In the present study, *Tinea capitis* infection was more prevalent among males (57.3%) than females (42.7%), a trend that aligns with studies from Iraq, Ethiopia, and Pakistan, which reported higher infection rates among males than females (Al-Dulaimi, 2015; Kidane, 2016). This gender disparity may be attributed to differences in exposure to sources of infection, such as environmental or occupational factors, and possibly behavioral factors that increase contact with contaminated surfaces**.**

Our study further highlighted that *Tinea capitis* disproportionately affects younger age groups, with children aged 6–12 years representing 47.8% of cases, followed by the 1-5 years group at 37.1%. This trend aligns with findings from previous studies conducted in Zliten in which were found also that preschool Children were most susceptible age group to get infected with *Tinea capitis*. Furthermore(Arshah *et al.,* 2016), study in Egypt, which show that *Tinea capitis* is more common in younger age groups and declines with increasing age (El-Khalawany *et al.,* 2015) . Children are particularly susceptible due to close-contact environments in schools and limited understanding of hygiene practices, which facilitate the spread of fungal spores**.**

Regarding fungal species causing fungal infection of hair of head, *Microsporum canis* emerged as the most frequently isolated species, responsible for 22.5% of cases, followed by *Trichophyton verrucosum* (10.7%). This finding is consistent with a study conducted in Zliten in which was found also that *Microsprum canis* was the most frequent etiologic agent, as well in another part of Libya, one study had also identified *Microsporum canis* as a leading pathogen in *Tinea capitis* cases, particularly in regions with high human-animal interactions (Arshah *et al.,* 2017). Additionally, the high rate of scalp infections observed in this study (47.8%) aligns with findings from a study conducted in Ethiopia, which reported a prevalence of 44.3% among schoolchildren. This study noted a near distribution of dermatophyte infections, particularly on the scalp, highlighting the pathogen's affinity for keratin-rich environments, which fosters infection and transmission(Fikrie, 2023)

In summary, our findings highlight the importance of both KOH microscopy and fungal culture in diagnosing *Tinea capitis* and reinforce that young children, particularly males, are at higher risk of infection. The predominance of *Microsporum canis* suggests zoonotic transmission may be a significant factor, emphasizing the need for awareness and preventive measures in households with pets. These insights

contribute to a deeper understanding of *Tinea capitis* epidemiology in Libya and underline the importance of targeted public health interventions.

4. Conclusion

This study provides valuable insights into identification of Etiology und Epidemiology of fungal infections in Zliten City. The most affected age group were children and males were more frequently affected than females. The most common etiologic causative species was *Microsporum canis* followed by *Trichophyton verrucosum.* KOH mounts remain the easiest, rapid, and valuable diagnostic tool to diagnose fungal infection of hairy region of head.

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