Original Article

Mycological and Biochemical Investigation of Dermatitis in Cats in the Iraqi Region of Al-Anbar

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Abstract

Introduction: Ringworm, also known as dermatophytosis, is one of the most common fungal skin diseases affecting domestic cats worldwide. Its zoonotic potential poses a risk to both veterinary care and public health. This study investigated the distribution and prevalence of *Trichophyton mentagrophytes* and *Microsporum canis* in cats suspected of having dermatological conditions in several regions of Al-Anbar province, using conventional mycological and biochemical methods. **Methods:** The research was carried out at veterinary clinics in the towns of Ramadi, Fallujah, Hit, Anah and Rawah in Al-Anbar province, Iraq, between August 2025 and January 2026. A clinical examination was performed on 100 domestic cats with dermatological lesions. Wood's lamp inspection, direct microscopic analysis using potassium hydroxide, fungal culture on dermatophyte test medium, lactophenol cotton blue staining, and urease testing for species differentiation were applied to samples of hair and skin scrapings. **Results:** Dermatophytes were most prevalent (54%) among the domestic cats examined in the Al-Anbar regions studied. The most common species identified was *M. canis* (45%), while *T. mentagrophytes* was isolated less frequently (9%). **Conclusion:** The findings demonstrate the continuing epidemiological importance of dermatophytosis in cats as a zoonotic problem and confirm the reliability of traditional mycological techniques for species identification in routine veterinary care. To reduce transmission risk, increased owner education, hygienic procedures, and surveillance are recommended.

Keywords: Cats, dermatophytosis, *Microsporum canis,* mycological diagnosis, prevalence, *Trichophyton mentagrophytes*

Introduction

Ringworm, also known as dermatophytosis, is one of the most prevalent fungal skin illnesses that affect domestic cats globally. Dermatophyte fungi that damage keratinized tissues, such as skin, claws and hair (1). It is a significant problem in both veterinary medicine and public health due to its contagious nature and propensity for zoonosis (2). Dermatophytosis is one of the most common superficial mycoses, affecting up to 25% of people globally. In addition, a large number of domestic animals are impacted (3). Dermatophytes are divided into three main genera*: Microsporum, Trichophyton and Epidermophyton*. In accordance with the author (4), this kind of fungal different in the epidemiological features, infectiousness and host compatibility. The genus *Microsporum* is the cause of a great deal of feline disease. Almost 90% of dermatophytosis occurrences in domestic cats worldwide have been caused by *Microsporum canis*. The primary routes of transmission are direct contact with infected animals. Contaminated fomites, which may rapidly spread throughout veterinary facilities and homes, include shaving equipment, transport cages, bedding, litter boxes and clothes (5). Cats are this species' major reservoir, with higher infection rates in a small population of cats, especially in multi-cat populations and houses (6).

Clinically, infected cats may show partial hair loss with localised or multifocal circular alopecia, crust development and scaling. The severity of pruritus varies significantly among afflicted animals, and other symptoms, including erythema at the lesion borders, are commonly seen (4,6,7).

Several regional studies carried out in Egypt, Iraq, Portugal, Thailand and Switzerland have demonstrated that *M. canis* is

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the most common dermatophyte species isolated in cats and an important cause of human infection (8-12).

In addition to *M. canis*, other zoophilic dermatophytes, particularly *Trichophyton mentagrophytes,* play a significant role in both human and animal infection (13). Zoophilic dermatophytes are the important etiological agents of zoonotic skin lesions affecting humans and companion animals (14). Although *T. mentagrophytes* is less frequently isolated from cats compared to *M. canis*, it remains of considerable public health importance due to its zoonotic potential and its ability to induce inflammatory skin lesions (15).

Therefore, the present study aims to determine the prevalence and distribution of *M. canis* and *T. mentagrophytes* in cats with suspected dermatophytosis using conventional mycological and biochemical methods.

Materials and Methods

Between early August 2025 and the end of January 2026, the study was conducted at several veterinary clinics in the province of Al-Anbar, Iraq, particularly in the towns of Ramadi, Fallujah, Hit, Anah and Rawa. These clinics often receive pet cats for examination and treatment.

The study involved one hundred domestic cats with dermatological problems, including skin scaling and alopecia. During the clinical evaluation, information on age, sex and breed was collected using a standardised questionnaire.

A Wood's lamp that emitted ultraviolet light (UV) was used to screen each cat for dermatophyte infection after a clinical examination. The presence of luminous hairs was identified as a preliminary indicator of a possible dermatophyte infection. Wood's lamp examination is a supportive rather than definitive screening tool (5,14) [Figure 1].

The samples of skin and hair were taken aseptically from the edges of active lesions using sterile tools. Every sample was put in a sterile plastic container; all data were recorded in standardised recording forms, kept in a refrigerated transport box and sent the same day to the University of Fallujah's College of Veterinary Medicine's Clinical Pathology Laboratory for more processing.

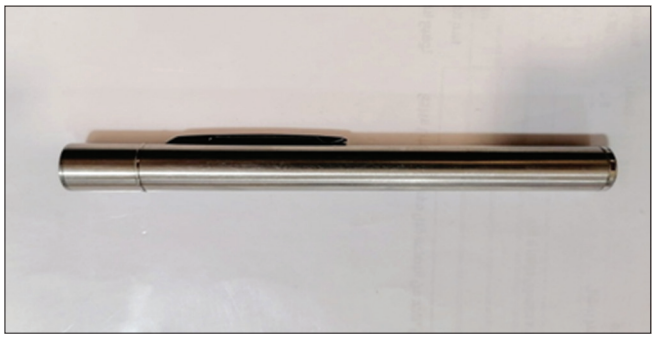

Figure 1: Wood's lamp ultraviolet light pin

When access to the clinical pathology laboratory was available, direct microscopy was used to analyse skin scraping and hair samples using a potassium hydroxide (KOH) preparation. To help with keratin digestion, a tiny part of each sample was put on a glass slide, treated with 10%–20% KOH, covered with a coverslip and left for 10–15 min. Under light microscopy (×10 and ×40), slides were inspected for the presence of arthroconidia and fungal hyphae for the first identification of dermatophyte infection (16).

Dermatophyte test medium (DTM) (HiMedia, India; REF: M188-500) was used to inoculate all samples, which were then incubated at 27°C. For a maximum of 4 weeks, as dermatophytes may require prolonged incubation for visible growth (5,17); cultures were monitored twice a week. By the conclusion of the 4th week, plates with no fungal growth were deemed negative (5). Colony shape, texture, pigmentation, microscopic features and the distinctive colour shift of the DTM from yellow to red caused by dermatophytes producing alkaline metabolites were used to identify the positive cultures (5,18).

Lactophenol cotton blue (LPCB) staining was used to analyse a part of each sample under a microscope to identify fungal parts, comprising hyphae and arthroconidia. The adhesive tape approach was employed in accordance with standard mycological methods to enhance the visibility of fungal structures (4).

Finally, the urease test was applied as an additional chemical test to assist in the differentiation of dermatophyte species. Fungal isolates were inoculated onto urea-containing medium and incubated at temperatures ranging from 25°C to 28°C. Test results were monitored daily for the development of a colour change indicative of urease enzyme activity. A positive urease reaction was considered suggestive of *T. mentagrophytes*, whereas *M. canis* typically exhibited a negative or weak reaction. The results of the urease test were interpreted and used as complementary evidence alongside microscopic, cultural and molecular identification methods (5,16).

Ethical approval

The ethical approval for our study [Mycological and Biochemical Investigation of Dermatitis in Cats in the Iraqi Region of Al-Anbar] was provided by the Scientific Research Ethical Committee of Veterinary Medicine College / University of Fallujah, (N° 6) on 3 February 2026.

Results

Each pet's cats were examined and showed dermatological lesions which indicated dermatophytosis, including scaling, round skin lesions and multiplex or localised alopecia. Applying Woods lamp UV pin light to inspection [Figure 1]. Every cat during inspection indicated apple-green fluorescence in hair. This finding supported the mycological investigation and confirmed the clinical suspicion [Figure 2].

Rapid preliminary diagnosis

Direct microscopy was used to analyse skin scraping and hair samples using a KOH preparation that dissolves keratin, allowing clear visualisation of fungal elements such as hyphae and arthroconidia [Figure 3].

Growth of fungi was observed in 54 from 100 cats examined after being grown on DTM, showing a 54% overall dermatophyte prevalence. The DTM has a characteristic colour change from yellow to red in cultures with positive results, indicating that dermatophytes produced alkaline substances. Macroscopically, *M. canis* produced white to creamy, fluffy surface formation with pale yellow colour while *T. mentagrophytes* showed powdery to granules colonie with a white form [Figure 4].

The microscopic examination by LPCB stain confirmed the isolated dermatophytes' morphological characteristics. The isolated *M. canis* appeared to have septate hyphae and numerous spindle-shaped macrocondida with narrow ends and thick walls, which is similar to ectothrix hair invasion [Figure 5].

On the other hand, the type level differentiation in *T. mentagrophytes* was established by the amount of spherical to pyriform microcondida that crowded along the septate hyphae [Figure 6].

The microscopic identification was confirmed by biochemical differentiation using the urease test. A reliable distinction between the two types of fungi was made available by the rapid urease positivity of *T. mentagrophytes* isolates, with the urease-negative condition of *M. canis* isolates [Figure 7].

M. canis was the more prevalent species from all the cats that were examined; it was isolated at 45% (45/100) of the cases, while *T. mentagrophytes* was appeared 9% (9/100). Forty-six per cent of samples are showing no evidence of dermatophyte growth [Table 1].

The Chi-square analysis revealed a statistically significant difference in the distribution of fungal species among the examined samples ($\chi^2 \approx 26.7$, $P < 0.001$). *M. canis* was the predominant species, accounting for 45% (45/100) of the total samples, whereas *T. mentagrophytes* was detected in only 9% (9/100) of cases. In contrast, 46% (46/100) of the samples showed no fungal growth. These findings indicate a significantly higher prevalence of *M. canis* compared to other species.

Male cats formed 57.4%, while female cats formed 42.6% of all positive culture cases (54) [Table 2].

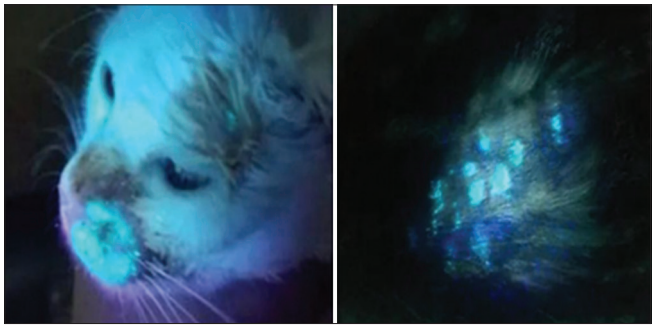

Figure 2: Examination of a cat using a wood's lamp ultraviolet pin light. The left and right images show the location of the infected area (head and back)

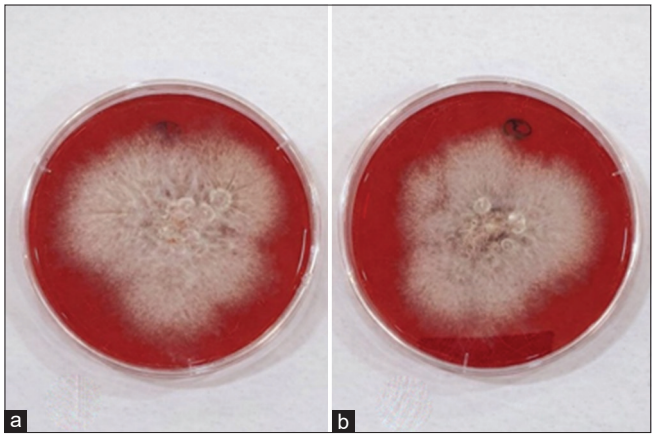

Figure 4: Macroscopic morphology of dermatophyte colonies grown on dermatophyte test medium. (a) Microsporum Canis (b) Trichophyton mentagrophyte

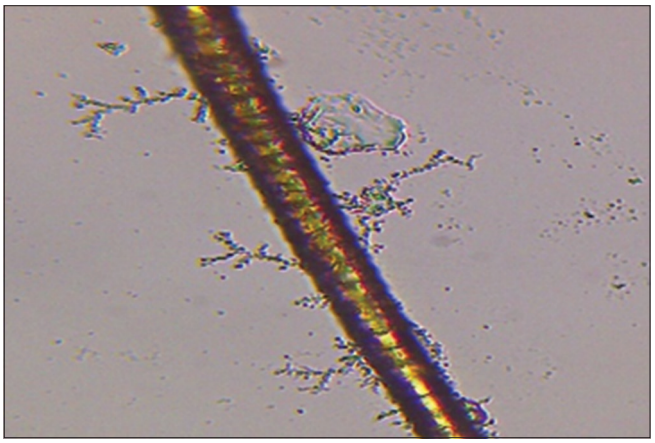

Figure 3: Ectothrix spores of *Microsporum canis*

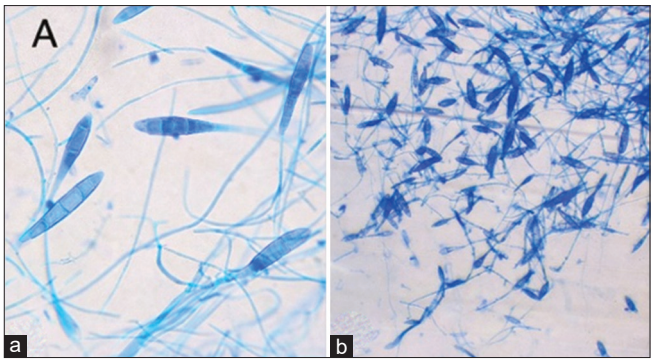

Figure 5: Microscopic appearance of *Microsporum canis*, (a) at ×40 magnification showing microscopic features of *M. canis*, (b) at ×10 magnification showing microscopic features of *M. canis*

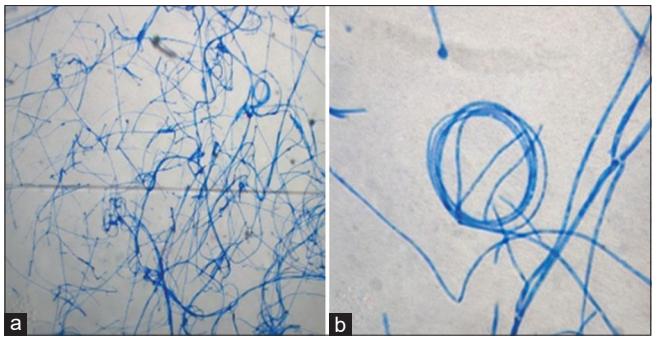

Figure 6: Microscopic appearance of *Trichophyton mentagrophytes*, (a) at ×10 magnification showing microscopic features of *T. mentagrophytes*, (b) at ×40 magnification showing microscopic features of *T. mentagrophytes*

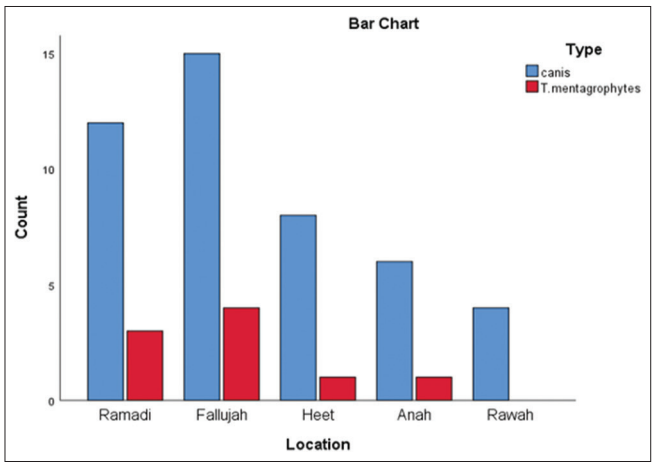

Figure 8: Distribution of dermatophyte species (*Microsporum canis* and *Trichophyton mentagrophytes*) across different locations

Table 1: Distribution of dermatophyte species among examined samples

Species	Number of cases	Ratio%
M. canis	45	45**
T. mentagrophytes	9	9
Un none	46	46
Total	100	100

Significant	Expected values	*P*	Degrees of freedom	χ^2
Yes	33.33	0.001	2	26.7

**High significant difference at $P<0.001$. *M. canis: Microsporum canis, T. mentagrophytes: Trichophyton mentagrophytes*

Chi-square for this comparison was $\chi^2 \approx 1.185$ $P > 0.05$, and this value explicitly shows there are no significant differences between the infected samples according to sex.

The data presented in Table 3 and Figure 8, demonstrate a clear regional variation in the distribution of dermatophyte infections among examined cats. Fallujah recorded the highest proportion of positive cases (35.2%), followed by Ramadi (27.8%), while lower prevalence rates were observed in Hit (16.7%), Anah (13.0%) and Rawah (7.3%).

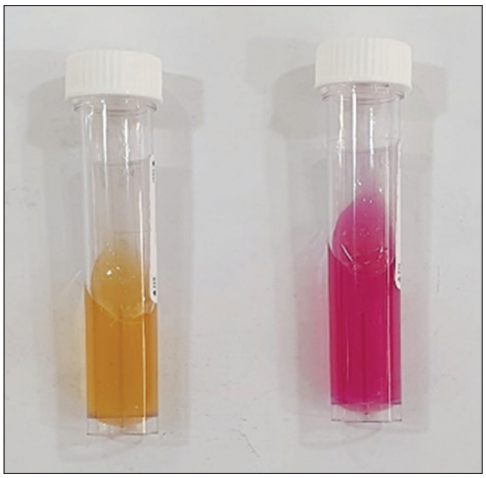

Figure 7: Urease test results for differentiation of dermatophyte species

Regarding species distribution, *M. canis* was the predominant dermatophyte across all regions, accounting for the majority of infections, particularly in Fallujah (15 cases) and Ramadi (12 cases). In contrast, *T. mentagrophytes* was detected at lower frequencies, with its highest occurrence also in Fallujah (4 cases), while it was absent in Rawah.

The result of the Chi-square test is $\chi^2 \approx 20.90$ $P < 0.05$, which significantly refers to the significant distribution between samples were the infected samples, according to the region, are above the expected value present in Ramadi with 15 samples and Fallujah with 19 samples.

Based on the age examination, cats among 7–12 months had the highest infection rate (50%) followed by cats among 0–6 months and 13–18 months (20.4%). The smallest percentage was seen in cats among the 19–24 months (9.2%) [Table 4].

The result of the Chi-square test for this ratio $\chi^2 \approx 19.77$ $P < 0.05$ presented a significant difference between the observed and expected age categories.

According to the breeds, the most prevalent show in Persian cats (24.0%) and crossbred cats (22.2%), followed by the Anchor and Himalayan breeds. British, Chinchilla and different species had lower infection rates [Table 5].

The Chi-square value $\chi^2 \approx 16.22$ $P < 0.05$ shows a statistically significant difference between the observed and expected results of the breeds presented in the collected sample.

Discussion

According to the present study findings, the overall infection rate of cat dermatophytosis was 54% (45 *M. canis* and 9 *T. mentagrophytes* out of 100) [Table 1]. This finding indicates that *M. canis* is the predominant dermatophyte species in the studied region. These results are comparable to those of (19), who reported a prevalence of approximately 55% in cats. An isolated rate of 44.36% of *M. canis* and *T. mentagrophytes* was isolated from 5.08% of dermatophytes from cats in Kurdistan, Iraq, by Jarjees (9).

Similar epidemiological patterns of dermatophytosis have been reported in various international epidemiological studies, particularly in places where dermatophyte transmission is promoted by contamination of the environment, direct animal contact and poor hygiene standards (4,14).

Previous studies have consistently reported that *M. canis* is the predominant aetiological agent of dermatophytosis in small animals, particularly in cats, with an important role in zoonotic transmission. Mattei *et al*. (20) highlighted in their review that *M. canis* accounts for the majority of dermatophyte isolates, often exceeding 50%–60% of cases, emphasising that cats act as a primary reservoir for infection. Similarly, Brilhante *et al*. (21) reported a high prevalence of *M. canis* in Northeast Brazil, where it represented more than 60% of dermatophyte isolates predominance in cats. The authors attributed this high prevalence to environmental and management factors, including free-roaming behaviour, close animal contact and limited veterinary care.

A study conducted in Western Turkey by Seker and Dogan (22) demonstrated that *M. canis* is the predominant dermatophyte species isolated from cats, followed by *Microsporum gypseum* and *T. mentagrophytes* as less frequently identified species. Similarly, a recent global review by Moskaluk and VandeWoude (23) confirmed that *M. canis* remains the principal aetiological agent of feline dermatophytosis worldwide, whereas *M. gypseum and T. mentagrophytes* are considered secondary, less common species.

Studies from Europe, the Middle East and Southeast Asia have shown parallel dominance of *M. canis*, indicating its importance for global epidemiology (8,10,11).

Conventional mycological diagnosis based on direct microscopy, followed by culture, remains generally accepted as the reference method and is still seen as a reliable and inexpensive option, especially in labs with limited access to molecular techniques (17,18,24,25).

A statistically significant relationship between sex and dermatophyte infection [Table 2] is in parallel with previous studies, which have suggested that male cats may be more susceptible to dermatophyte infections than females, largely due to behavioural and environmental factors. For example, Ngwogu and Otokunefor (26), in a study conducted in a rural community in Eastern Nigeria, reported a higher prevalence of dermatophytosis among males, attributing this finding to increased outdoor activity, frequent contact with contaminated environments and close interaction with other animals. Similarly, Mattei *et al*. (20) observed a slightly higher frequency of dermatophyte infections in male cats.

A higher prevalence of dermatophyte infection was observed in male cats compared to females, as shown by Minnat and Khalf (27), who documented infection rates of 29% males and 14.4% in females. Mattei *et al*. (20) demonstrated that dermatophyte infections were more prevalent in male cats (65.7%) than in females (34.4%), suggesting a possible influence of behavioural factors on disease transmission. The effect of sex on this result may be explained by the activity of males, which may increase skin abrasions and injuries, which is a predictor for dermatophyte infection (7).

There have been geographical variations in the prevalence of dermatophytosis. Regional variability in dermatophytes prevalence of cats appears higher infection rates in

Table 2: Prevalence ratio of positive sample according to the sex

Sex		Number of cases		Ratio%
Male		31		57.4*
Female		23		42.6
Total		54		100
Significant	**Expected values**	***P***	**Degrees of freedom**	χ^2
No	27	0.276	1	1.185

*Significant difference at $P<0.05$

Table 3: Prevalence ratio of positive samples according to the region

Region	Type of fungi	Number of cases	Ratio%	Total number of cases	Total ratio%
Ramadi	*M. canis*	12	22.2	15	27.8
T. mentagrophytes	3	5.6			
Fallujah	*M. canis*	15	27.8	19	35.2
T. mentagrophytes	4	7.4			
Heet	*M. canis*	8	14.8	9	16.7
T. mentagrophytes	1	1.9			
Anah	*M. canis*	6	11.1	7	13.0
T. mentagrophytes	1	1.9			
Rawah	*M. canis*	4	7.3	4	7.3
T. mentagrophytes	0	0			
Total		54	100	54	100
Significant		**Expected values**	***P***	**Degrees of freedom**	χ^2
Yes		10.8	0.0001	4	20.90

M. canis: Microsporum canis, T. mentagrophytes: Trichophyton mentagrophytes

Table 4: Distribution of dermatophytosis-positive cases across different age groups

Age (months)	Number of cases		Ratio%	
0–6	11		20.4	
7–12	27		50.0*	
13–18	11		20.4	
19–24	5		9.2	
Total	54		100	
Significant	**Expected values**	***P***	**Degrees of freedom**	**χ^2**
Yes	13.5	0.0001	3	19.778

*Significant difference at $P<0.05$

Table 5: Distribution of dermatophytosis-positive cases among different cat breeds

Breeds		Number of cases		Ratio%
Crossbreed		12		22.2
Persian		13		24.0
Chinchilla		5		9.3
British		5		9.3
Himalayan		7		13.0
Anchor		7		13.0
Other breeds		5		9.3
Total		54		100
Significant	**Expected values**	***P***	**Degrees of freedom**	**χ^2**
Yes	7.71	0.023	6	16.222

Fallujah (35.2%) and Ramadi (27.8%), then Hit, Anah and Rawa [Table 3 and Figure 8].

This study's high geographic variation may be related to variation in housing circumstances, owner knowledge, cleanliness of the environment and cat population numbers, with more infections occurring in Fallujah and Ramadi. Similar environmental and management-related factors have been reported to influence dermatophyte transmission (14).

Furthermore, certain epidemiological studies have demonstrated that a large population density, unclean conditions and inadequate sanitary conditions are the significant risk factors for a higher incidence of dermatophytosis (28).

A significant association between age and dermatophyte infection was observed, with younger cats (7–12 months) showing a higher prevalence [Table 4]. This may be attributed to their immature immune response and is consistent with findings reported by (19,20). The results of the present study showed that animals younger than 1 year were the most affected by dermatophytosis. This finding is consistent with previous reports. In Iraq, Minnat and Khalf (27) observed a higher prevalence of dermatophytosis among young cats in Baghdad Governorate, attributing this to the immaturity of the immune system and increased susceptibility to fungal infection at an early age. Similarly, Zaki *et al*. (29) in their review covering Indonesia and Turkey, reported that younger animals are more frequently affected by dermatophytosis, emphasising that age-related factors such as underdeveloped immunity, close contact during early life and higher environmental exposure play a critical role in disease transmission. As indicated by (5), Kittens are most susceptible to dermatophytosis due to their elevated exposure to contaminated environments, immaturity and lack of immunity.

Infection and breed were shown to be significantly correlated in this study [Table 5]. Coat length, hereditary risk and grooming techniques can all contribute to higher frequency in crossbred and specific breeds (2). Long-haired cats, in particular, are better at keeping onto fungal spores, which may promote colonisation and transmission (5,11).

In general, the study data demonstrate the continuing importance of cats in Iraq for both public health and veterinary treatment. In veterinary clinics, the elevated frequency of *M. canis* indicates the zoonotic danger associated with diseased cats and the importance of regular screening, stringent hygiene protocol and owner information. Although traditional diagnostic methods worked successfully in this research, individual-level confirmation and epidemic monitoring may be further improved by future investigations using molecular methods.

Conclusion

According to this study, feline dermatophytosis is still common in the several regions of the province of Al-Anbar. *M. canis* is the most common pathogenic species, although *T. mentagrophytes* was detected less frequently. These results show the significance of dermatophytes in veterinary and zoonotic environments. Thus, it is essential to take the proper steps when caring for felines to minimise the risk of disease for people.

Data availability

Information is accessible upon request.

Author contribution

Othman Munther Thaker was responsible for sample collection, practical work, and manuscript writing, while Ass. Prof. Dr. Omar Atalla Fahad contributed by editing and reviewing the manuscript.

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Conflicts of interest

There are no conflicts of interest.

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