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## **Clinical and Microscopic Evaluation of Dermatophytosis in Suspected Feline Cases**

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### **Abstract**

Dermatophytes are a category of fungi that preferentially target keratin and can infect the skin, hair, and nails. They are ubiquitous globally but more prevalent in warm and wet regions. These pathogens are zoonotic and represent a considerable source of infection for humans. The present study is designed to document the feline dermatophytosis of cats in Basra province, Iraq. The current study included 100 cats, eighty cats clinically infected with dermatophytosis in different ages, sexes, and breeds, in addition, 20 cats clinically healthy were considered as a control group. The results of the clinical signs included circular lesion or alopecia (1-3 cm) small and round patches of hair loss 80 (100%), Broken hairs around lesion appear frayed like a paintbrush 74 (59.2%), grayish- white scales (dandruff like) 72 (57.6 %), thickening of skin, especially on pressure points or chronic lesion 38 (30.4%) and erythema or mild redness 27 (21.6%). According to breed the results showed incidence of dermatophytosis in Shirazi Persian followed by Himalayan Persian, house cats and Scottish cats, while according to the sex dermatophytosis more incidence in male than female, According to age, the infected percent of dermatophytosis were more incidence in cats less than nine-month-old 52 (65%), In addition to cats infected with dermatophytosis, lesions commonly manifest in ears 12 (15%), face 11 (13.75%), abdomen 10 (12.5%), head 8 (10%), tail 7 (8.75%), The results of wood lamps examination indicated all the suspected infected cats (80 cats) were positive for dermatophytosis, microscopic examination indicated the ectothrix more incidence the endothrix. **Key words: Microscopic, Clinically, Cats, dermatophytosis.**

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## **Introduction:**

Dermatophytes are a group of fungi that have a preference for keratin and can infect the skin, hair, and nails. They are present in all parts of the world, but are more common in hot and humid areas. These pathogens are zoonotic and can serve as a significant source of infection for humans. The prevalence and clinical presentation of these fungi vary significantly depending on geographical location and epidemiological parameters such as age, sex, and seasons [1; 2]. Dermatophytes are often categorized based on their environment. Anthropophilic dermatophytes specifically infect humans and can cause mild to severe, localized or diffuse skin infections. Zoophilic and geophilic dermatophytes infect both animals and humans. Dermatophytes are a type of fungi that are found worldwide. They belong to various genera, including *Arthroderma*, *Nannizzia*, *Trichophyton*, *Microsporum*, *Epidermophyton*, *Lophophyton*, and *Paraphyton* [3]. *Microsporum canis* and *Trichophyton mentagrophytes* are the most common types of dermatophyte species seen in small animals. *M.canis* is the predominant dermatophyte, responsible for more than 80% of dermatophytosis cases in dogs and cats. In contrast, *T. mentagrophytes* infection is seldom (5%), and *M. gypseum* infection is

rare (1–3%) [4; 5]. Dermatophytes have a strong attraction to tissues that contain keratin, which is why they are responsible for causing superficial fungal infections of the skin, nails, and hair [6]. The clinical manifestation and course of dermatophyte infection are influenced by various factors, including the location of the infection, gender, age, the immunological status of the host, and the specific species of dermatophytes causing the infection [7; 8; 9]. The standard methods employed for the laboratory diagnosis of dermatophytosis include direct microscopic inspection and culture. However, the identification of dermatophytes typically relies on cultural examinations, which are time-consuming and can take up to 14 days. Additionally, this method is often hindered by the growth of other fungi that are commonly found in animal skin or hair samples [10]. The aim of the research is to examine the microscopic and clinical symptoms resulting from feline dermatophytosis in the Basrah area, Iraq.

## **Materials and Methods:**

**Sample collections** The study was conducted from July 1, 2024, until March 30. The samples were obtained from various clinics and veterinary hospitals within Basrah province, a total of eighty samples in number.

A variety of clinical specimens, including hair and nail fragments, swabs, and 20 control samples, were obtained from veterinary clinics in Basrah Governorate. Additionally, skin scraping was performed. The collected samples were placed separately in sterile plastic containers for transport to the laboratory for the detection of dermatophytosis. Each of them is characterized by unique and specific facts. The abraded dermis was gathered utilizing a sterilized slide. Following the application of 70% ethanol to the afflicted region. The hair that is impacted is extracted using a sterilized pair of forceps [11].

The collected specimens were delivered to the laboratory in appropriate sterile containers. Stringent measures were implemented to prevent contamination and misplacement of the samples during transportation. The specific information on the clinical samples was recorded in the proforma data register. The study primarily examined clinical symptoms, Wood's Lamp Examination, Total and Absolute Differential Leukocyte Counts, and conducted direct microscopic inspection.

#### **Total and Absolute Differential Leukocyte Counts**

Blood samples were collected from the cephalic vein of both control and infected cats using EDTA tubes to prevent clotting. The total leukocyte count (TLC) and the absolute differential leukocyte count were measured using a veterinary automated hematology analyzer designed for small animals. The device provided direct counts for total white blood cells as well as absolute values for neutrophils, lymphocytes, monocytes, eosinophils, and basophils.

#### **The Wood's Lamp Examination of the Infected Cats:**

The Wood's lamp examination is a diagnostic test employed in veterinary clinics to identify dermatophytosis (ringworm) in cats. During the inspection, dim the room and uses a Wood's lamp to illuminate the cat's fur, particularly in regions where there is hair loss, redness, or suspected illness [12].

#### **Direct microscopic examination:**

Skin scrapings, nail clippings, and hair roots are carefully positioned on a glass slide. One or two drops of potassium hydroxide (K.O.H.) are applied, and then a coverslip is placed on top. The preparation is gradually cooked by running the slide over a Bunsen burner 3-4 times. The slide is left at ambient temperature for a brief duration. Microscopic examination at a magnification of 40x was

conducted to observe the presence of septate hyphae and arthroconidia, as described by[13].

### **Results**

#### **Clinical signs:**

The results of the clinical signs which observed of eighty cats (different age, bred and sex) suspected infect with dermatophytosis of Basrah province, the

clinical signs included circular lesion or alopecia (1-3 cm) small and round patches of hair loss 80 (100%), Broken hairs around lesion appear frayed like a a paintbrush 74 (59.2%), grayish- white scales (dandruff like) 72 (57.6 %), thickening of skin, especially on pressure points or chronic lesion 38 (30.4%) and erythema or mild redness 27 (21.6%) table (1) and figure 1. (Figure2: A, B, C, D).

**Table (1) the clinical signs showed cats infected with dermatophytosis**

No.	Lesion	Numbers	Percent (%)
1	Alopecia	80	100%
2	Broken hairs	74	59.2%
3	Scales (dandruff like)	72	57.2 %
4	Thickening of skin	38	30.4%
5	Erythema or mild redness	27	21.6%



**Figure1:(A,B,C,D): A : Localize circular patch alopecia and hyperpigmentation in forelimb in cat infected by dermatophytes . B: Cat infected by dermatophytes was represented clinically by local a circular alopecia , scales and crust on the head . C: A cat with localize lesions on tail and hindlimb, alopeic areas, erythematous, crust and scales infected by dermatophytes. D: multifocal alopecia and hyperkeratosis and scales and crust in abdominal region and hindlimbs in cat infected with dermatophytes.**

According to breed, the results showed incidence of dermatophytosis in Shirazi Persian followed by Himalayan Persian, house cats, and Scottish cats, while according

to the sex, dermatophytosis had a higher incidence in males than females table (2).

**Table (2) the incidence of dermatophytosis according to the sex and breed.**

Breeds	Gender		
	Male	Female	Total
Shirazi Persian	17	12	29
Himalayan Persian	15	11	26
House cats	8	6	14
Scottish cats	7	4	11
Total	47	33	80

According to age, the percentage of infected cases of dermatophytosis was higher in cats less than nine months old, 52 (65%), while

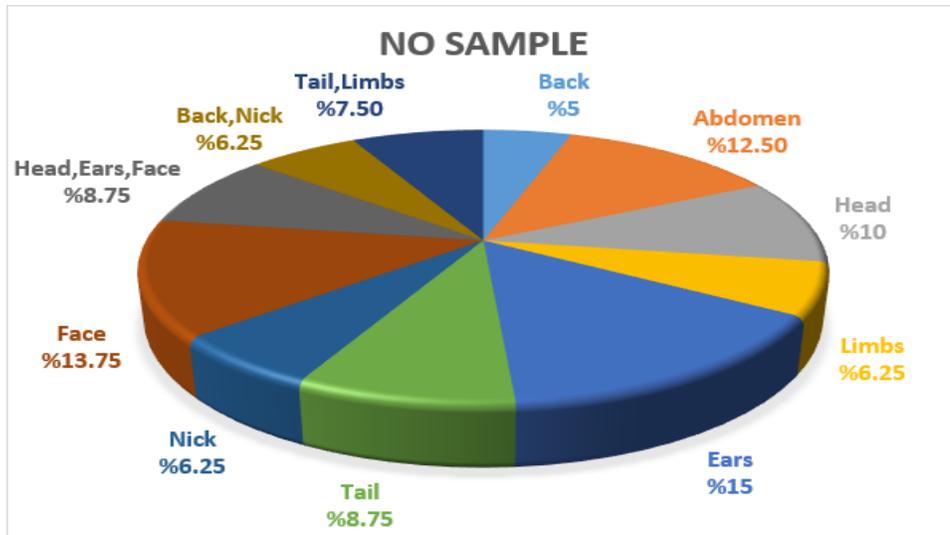
less incidence in cats more than nine months old (35%) table (3).

**Table (3) Percent the Dermatophytosis infection according to age.**

Age	No samples	Percentage
More than 9 months	28	35%
Less than9 month	52	65%
Total	80	100%

In cats infected with dermatophytosis, lesions commonly manifest in various regions of the body, these affected areas, including ears 12 (15%), face 11 (13.75%), abdomen 10 (12.5%), head 8 (10%), tail 7

(8.75%), the head with face and ears 7 (8.75%), tails with limbs 6 (7.5), limbs 5 (6.25%), neck 5 (6.25%), back and neck 5 (6.25%) and back 4 (5%). The distribution shown in figure 2.



**Figure2: Distribution according to site of lesion.**

The results appear to have a non-significant difference between infected cats compared to control group table 4.

**Table (4) Total and absolute differential leukocytes count in infected Cats compared the control group.**

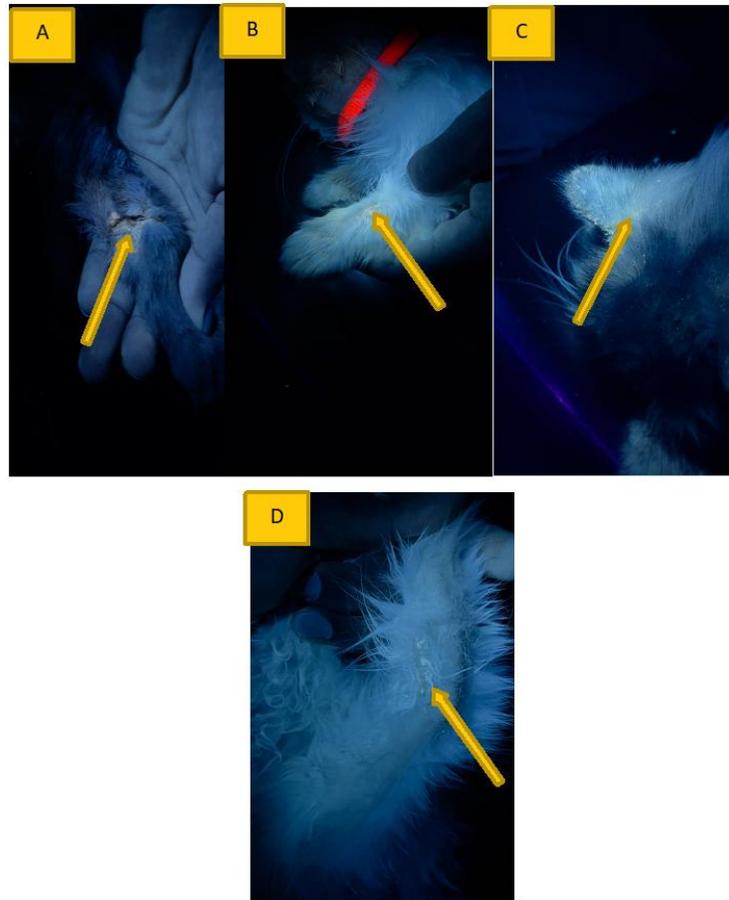
Parameter \ Groups	Control Mean $\pm$ S.E	Infected Mean $\pm$ S.E
TLC $\times 10^3 \mu\text{l}$	8.92 $\pm$ 1.68	9.12 $\pm$ 1.02
Neutrophiles $\times 10^3 \mu\text{l}$	5.82 $\pm$ 1.26	5.36 $\pm$ 1.74
Lymphocytes $\times 10^3 \mu\text{l}$	3.16 $\pm$ 0.52	3.64 $\pm$ 0.38
Monocytes $\times 10^3 \mu\text{l}$	0.91 $\pm$ 0.07	0.84 $\pm$ 0.09
Eosinophiles $\times 10^3 \mu\text{l}$	1.5 $\pm$ 0.88	1.6 $\pm$ 0.68
Basophiles $\times 10^3 \mu\text{l}$	0.42 $\pm$ 0.11	0.37 $\pm$ 0.24

P<(0.01) values are mean  $\pm$  stander error of mean .

**Wood lamps examination:**

The results of wood lamp examination indicated all the suspected infected cats (80 cats) were positive for dermatophytosis when

passed under UV light of a Wood’s lamp for the detection of ringworm and showed green fluorescence (Figures3).



**Figure5:(A, B, C, D): A: hind limb of cat infected by dermatophytosis was positive to examined by Wood lamps positive fluorescence. B: Wood's positive fluorescence revealed positive ear of the cat affected by dermatophytosis. Positive Wood's lamp analysis, apple green colour, localises a patch of baldness on the forelimb in a cat with dermatophytosis. D: Tail of cat infected by dermatophytosis was examined by wood positive fluorescence.**

**Direct microscopic examination:**

The direct microscopic examination of skin scrapings (hair and scales) samples from infected cats by dermatophytosis revealed the presence of fungal hyphae in 73 (91.25% )

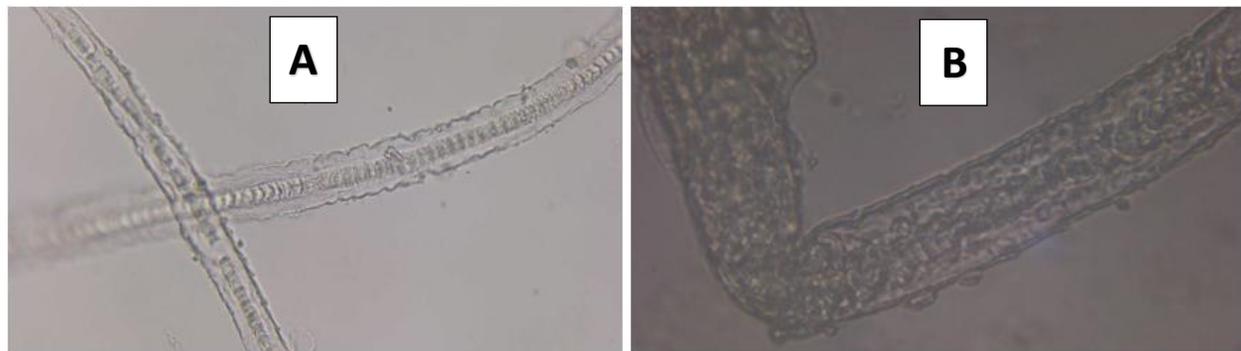
out of 80 infected cats, in addition to the microscopic examination show out 73 samples 72 (98.6%) samples were infected by ectothrix arthroconidia and only 1 (1.4%) sample were infected endothrix arthroconidia table (5).

**Table (5) the percent number of positive dermatophytosis by direct microscopic examination**

Samples	Microscopic examination	No (100%)	Total
Positive	ectothrix arthrospors	72(98.6%)	73(91.25%)
	endothrix arthrospors	1 (1.4%)	
Negative	0	7 (8.75%)	7 (8.75%)
Total			80 (100 %)

Under the microscope, the infected hairs appear with distinctive characteristics, including swollen, frayed, broken, irregular surface, or have a fuzzy outline due to spores/hyphae. Which present arthrospores in many forms firstly, the ectothrix

arthroconidia form on the exterior surface of hair shaft, with small, round or barrel-shaped 2-4 μm in diameter, form **linear chains** encircling the hair shaft as in genes *Microsporium canis* figure (4).



**Figure4: Microscopic hair contaminated with a fungal infection (ectothrix) showing spores on the outside surface of a hair shaft, indicating infection with *Microsporium canis*. A: shows fungal spores covering the outer surface of the hair (40x) . B: gives a clearer view of these external spores, confirming an ectothrix pattern without internal invasion(100x)**

**Discussion:**

Dermatophytes are a category of fungi that preferentially target keratin and can infect the skin, hair, and nails. They are ubiquitous

globally but more prevalent in warm and wet regions. These pathogens are zoonotic and represent a considerable source of infection for humans. These fungi's frequency and

clinical manifestation vary considerably according to geographical location and epidemiological factors such as age, sex, and seasonality [1; 14].

There is a type of fungus that affects cats, which causes lesions on a cat's head, ears, forelimbs, and any other part of the body (15). The clinical signs shown in infected cats with dermatophytosis include focal and multifocal alopecia. This appears as small or large areas of skin begin to lose hair, circular lesion (1-3 cm) small and round patches of hair loss broken hairs around lesion appear frayed like a paintbrush and grayish- white scales (dandruff like) this finding occurs may be due to the direct invasion and destruction of the hair shaft or due to the body's reaction to a fungal infection this finding agree with [16]. The fungal infections were common causes for skin diseases in Cats, followed by bacterial and Parasitic infections, respectively(17). The suggested dermatophytosis are keratinophilic, which digest hair keratin, the main protein in hair; this digestion leads to severe weakening of the hair shaft, making it extremely brittle. The dermatophytosis secretes keratinase enzymes that break down keratin into small particles and disorganized keratin debris. This damaged protein accumulates and clumps together on the skin surface, leading

to the formation of scales, and a grayish-white color reflects this mass of dead, damaged keratinocytes and fungal elements [18]. The present study indicated the Shirazi Persian and Himalayan Persian cats more susceptible to dermatophytosis than other cats breed may be due to their physical characteristics and grooming challenges, in addition to the biological difference in the immune response to the dermatophytosis this suggest corresponding with [19]they suggested this breed have a weak immune system against dermatophytosis at the cellular level, also this breed have a special coat structure acts mesh-like structure and incubator for spores, this interfere with their ability to remove those spores via grooming. Male cats were more likely to develop skin fungal infections than females, especially during the mating season. Due to several factors, including behavioral factors, male cats are often more territorial and interact more aggressively with other cats, which can lead to injuries or scratches, making them more susceptible to infection and social stress. During the mating season, male cats may experience increased stress due to mate competition. This stress can weaken their immune systems, making them more susceptible to infection. Also, outdoor activity, Male cats are often more likely to

roam outside during mating, increasing their exposure to fungal spores; this result agrees with [20; 21]. Which mentioned that the number of males infected is more than that of females. These factors combined can lead to a higher incidence of skin fungal infections in male cats during this critical period.

In our study, the age group of less than 9 months recorded the highest percentage of dermatophyte infections. This distribution indicates that younger age groups are more susceptible to infection, a result consistent with previous studies, such as [22; 23]. They showed that 78% of infections occurred in cats under one year of age. This is attributed to the weak or immature immune systems of young cats, making them less able to resist fungal pathogens. Active social behaviors, such as group play and physical contact, are also factors that facilitate the transmission of infection.

Lesions most seen in the ears, head, and face, particularly around the eyes and muzzle, may reflect the cats' exploration and playful behavior, which increases the susceptibility of these areas to infection. Tail involvement, particularly at the base, may be related to movement and environmental interaction, as the tail is exposed to more contact with contaminated surfaces. Paw

areas. Infection between the toes and on the pads suggests cats may pick up the fungus from contaminated surfaces, making the extremities susceptible to lesion development. Other areas Lesions on the neck, abdomen, and back suggest that the fungus can spread to different areas of the body, reflecting the contagious nature of the infection; this result agrees with [24; 25]. It was mentioned that the preferred sites include the ears, trunk, neck, and face.[16] The ears are more common sites for infection than other parts of the body due to the anatomical structure of the ears, which have a thinner haircoat compared to the trunk, which allows the dermatophytosis to have easier access to the skin surface where they germinate and infect. In addition to the cat's difficulty in grooming due to their inability to lick or groom their own ear pinnae, the ears are more susceptible to being infected by mites (*Otodectes*), causing scratches on the ears that can damage the skin, making dermatophytosis spores easier to invade.

Although dermatophytosis is a superficial fungal infection that primarily affects non-living tissues such as the stratum corneum, hair, and nails, it can still trigger an immune response from the host. This response may lead to detectable changes in white blood cell counts, especially in cases where there

is inflammation, hypersensitivity, or secondary bacterial infection caused by skin damage due to scratching. Therefore, evaluating total and differential leukocyte counts can provide supportive information about the animal's systemic immune status and the degree of inflammatory involvement, even when the infection itself is localized [26].

All the suspected cats were tested for dermatophytosis and passed under the UV light of Wood's lamp to detect ringworm; animals that tested positive for Wood's lamp showed a green fluorescence color. The presence of a tryptophan metabolite in *Microsporum canis*. Infected hair produces fluorescence under UV light. After the first week of infection, the property of fluorescence develops, and it can last at the tip of the hairs even after the infection has subsided; this result agrees with [27], which refers to *Micosporum. Canis* produces pteridine metabolites within the spores and hyphae; this compound accumulates in infected hair and fluoresces a characteristic apple-green or yellow-green color when exposed to UVA light, while the *Trichophyton* spp. Don't produce the specific pteridine metabolites, therefore don't fluoresce with exposed UVA.

The results of microscopic examination identified fungal hyphae in 73 out of 80 cats; the ectothrix were 72 out of 73, and one sample was endothrix, indicating that ectothrix is more prevalent than endothrix. We suggest the ectothrix characteristic form for *Microsporum canis*, while the endothrix characteristic form for *Trichophyton*. This result agrees with [28; 29], who reported that the affected hairs showed characteristic features, including enlargement and swelling with a rough and irregular surface. These features are typically associated with fungal infections because dermatophytes can secrete enzymes that break down keratin and cause structural changes in the hairs, making them appear eroded and damaged. The Potassium hydroxide allows the keratin in hair and skin to be dissolved, making it easier to visualize fungal hyphae under a direct microscope. This method is helpful for the rapid detection of dermatophytes. Also, these features are evidence of an advanced stage of infection, where the fungi have had enough time to secrete enzymes such as keratinase, which leads to swelling and roughness of the surface of the hairs, which are typical signs of skin fungal infections [30,31,32].

#### **Conclusion:**

Cats less than nine months old showed a greater frequency of infection than older cats, implying a probable age-related sensitivity. Though further research is needed to verify this tendency, male cats were more often affected than female cats, suggesting a possible sex-related inclination.

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**Conflict of Interest:** Authors declare there is no conflict of interest.

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## التقييم السريري والمجهري لفطريات الجلد في حالات القلط المشتبه بها

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قسم الطب الباطني والوقائي، كلية الطب البيطري، جامعة البصرة، البصرة – العراق<sup>1</sup>.

### الملخص:

الفطريات الجلدية هي فئة من الفطريات التي تستهدف الكيراتين بشكل تفضيلي، ويمكن أن تصيب الجلد والشعر والأظافر. وهي منتشرة عالميًا، ولكنها أكثر انتشارًا في المناطق الدافئة والرطبة. هذه المسببات المرضية حيوانية المنشأ، وتمثل مصدرًا مهمًا للعدوى البشرية. صُممت هذه الدراسة لتوثيق داء الفطريات الجلدية لدى القطط في محافظة البصرة بالعراق. شملت الدراسة 100 قطة، منها 80 قطة مصابة سريريًا بداء الفطريات الجلدية من مختلف الأعمار والأجناس والسلالات، بالإضافة إلى 20 قطة سليمة سريريًا تُعتبر مجموعة ضابطة. وتضمنت نتائج العلامات السريرية آفة دائرية أو ثعلبية (1-3 سم) ويقع صغيرة ودائرية من تساقط الشعر 80 (100%)، وشعر مكسور حول الآفة يبدو متقصّفًا مثل فرشاة الرسم 74 (59.2%)، وقشور بيضاء رمادية (تشبه قشرة الرأس) 72 (57.6%)، وسماكة الجلد، وخاصة في نقاط الضغط أو الآفة المزمنة 38 (30.4%) واحمرار خفيف 27 (21.6%). أظهرت النتائج حسب السلالة حدوث فطريات الجلد في القطط الشيرازية الفارسية تليها القطط الهيمالايا الفارسية والقطط المنزلية والقطط الاسكتلندية، بينما حسب الجنس فإن فطريات الجلد أكثر حدوثًا في الذكور من الإناث، ووفقًا للعمر، كانت نسبة الإصابة بفطريات الجلد أكثر حدوثًا في القطط التي يقل عمرها عن تسعة أشهر 52 (65%)، بالإضافة إلى القطط المصابة بفطريات الجلد، تظهر الآفات بشكل شائع في الأذنين 12 (15%)، والوجه 11 (13.75%)، والبطن 10 (12.5%)، والرأس 8 (10%)، والذيل 7 (8.75%)، وأشارت نتائج فحص مصابيح الخشب إلى أن جميع القطط المشتبه بها (80 قطة) كانت إيجابية لفطريات الجلد، وأشار الفحص المجهري إلى أن الآفة خارج الشعرة أكثر حدوثًا من الآفة داخل الشعرة.

الكلمات المفتاحية: مجهريّة، سريريًا، القلط، فطريات الجلد.