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Clinical and Diagnostic Investigation of Canine Acariasis Infestation in Domestic Dogs

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Abstract

Background:

Canine acariasis refers to a contagious dermatological condition in dogs triggered by various parasitic mites, including *Sarcoptes*, *Demodex*, and *Otodectes*. These parasites either burrow into or inhabit the skin surface, leading to severe hair loss, crust formation, and intense pruritic dermatitis.

Aims: The study aimed to investigation of canine acariasis infestation, effect of sex, age and breed on infection rate of domestic dogs, also comparison the improvement severity of clinical signs before and after treatment with topical acaricide.

Material and methods: The collected skin scrapings were placed onto microscope slides and mixed with a 20% KOH solution. After being cleared through gentle warming and a brief incubation period, the specimens were covered, compressed, and systematically examined via light microscopy under reduced illumination using low- and high-power objectives.

Results:

Out of 50 examined dogs, 40 were positive for canine acariasis infestation (CAI), presenting as localized (62.5%, 25/40) or generalized (37.5%, 15/40) forms, with 50.0% (25/50) displaying otitis externa. The severity of the skin lesions was categorized using a three-tier scoring system: The clinical presentation was graded on a three-point scale: Score 1 indicated mild, widespread scaling absent of tissue thickening or hyperpigmentation. Score 2 was defined by regional patches exhibiting crusted, thickened, or hyperpigmented dermis. Lastly, Score 3 signified widespread zones of severe epidermal thickening and heavy crusting, paired with exfoliating debris and a potent malodor. Three mite species were identified among the 40 positive cases: *Sarcoptes scabiei* (45.0%), *Demodex canis* (30.0%), and *Otodectes cynotis* (25.0%).Regarding risk factors, higher infestation rates were descriptively observed in females (90.0%) than males (73.3%), in dogs aged 3–12 months (85.0%) than those aged 4–7 years (75.0%), and in German

Shepherds (86.7%) and Boxers (84.6%) than local breeds (72.7%). However, Chi-square analysis confirmed that host sex, age, and breed had no statistically significant effect ($p > 0.05$) on CAI infection rate. On the other hand, relationship of treatment with topical acaricide of infected dogs with CAI showed a decrease in severity degree of clinical signs before and after treatment as Score 3 before10 (25%), after 2 (5 %), Score 2 before 12 (30%), after 3 (7.5 %) and Score 1 before 12 (30%), after 5 (12.5 %) respectively. Whenever percentage of recovery of showed complete recovery was 70 % and partial recovery was 30 % for Canine acariasis infestation.

Conclusions: Canine acariasis infestations are very common in dogs in diyala province,direct microscopic examination of skin scraping ear swabs is a dependable way to diagnose the infection. Relationship of treatment with topical acaricide of infected dogs with CAI showed to be very effective in lowering the number of parasites and improving clinical signs.

Key word: Acariasis, Demodex, Sarcoptes, Otodetectes, topical acaricide, dogs.

Introduction:

Over the last few decades, canine acariasis has evolved into a rapidly spreading zoonotic threat, expanding its geographic reach and adapting to new host species (Escobar *et al.*, 2022). A major driver of this is sarcoptic mange, a ubiquitous condition affecting both domestic and wild mammalian populations (Curtis, 2012). The disease is caused by *Sarcoptes scabiei*, a microscopic epidermal-burrowing mite belonging to the order Sarcoptiformes—a group that also contains veterinary parasites like *Notoedres*, *Knemicodoptes*, and *Psoroptes*. This tunneling behavior triggers severe hypersensitivity, causing profound behavioral shifts, extreme weight loss, opportunistic secondary infections, and potentially fatal outcomes (Pence and Ueckermann, 2002; Arlian and Morgan, 2017; DeCandia *et al*., 2019; Tsakok *et al*., 2019). In contrast, *Demodex canis* represents a genus of elongated, commensal mites that normally inhabit healthy canine hair follicles without causing harm, feeding on sebum, cellular waste, and epidermal debris (Craig, 2020). Pathology occurs only when the host fails to control mite replication, a phenomenon heavily linked to immunosuppressive conditions or genetic predispositions in breeds like Pugs, Bulldogs, Pit Bulls, and certain Terriers (Mueller *et al*., 2020; Dryden, 2024).
Meanwhile, within the auditory structures, *Otodectes cynotis* is a widespread ear mite responsible for otodectic mange, primarily targeting the external ear canal to feed on localized tissue waste (Fischer *et al*., 2003; Radi, 2004; Oleaga *et al*., 2018). While *O. cynotis* infestations are often suspected due to clinical hallmarks such as aggressive head shaking, aural pruritus, foul-smelling waxy discharge, erythema, and visible irritation a definitive diagnosis of *S. scabiei* relies on microscopically identifying adult mites, larvae, ova, or fecal matter from multiple skin scrapings of active lesions (Lyskova and Mazurova, 2007; Marsella, 2021). For managing sarcoptic mange, European Union-approved interventions include spot-on formulations (selamectin or imidacloprid/moxidectin) and oral tablets (sarolaner, along with recently

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authorized options like afoxolaner and afoxolaner/milbemycin oxime). Additionally, systemic compounds such as ivermectin, doramectin, milbemycin oxime, and moxidectin serve as highly effective off-label alternatives (Romero *et al*., 2016; Taenzler *et al*., 2016).

Material and methods

Sample processing and examination:

A skin scraping involves taking a sample of skin cells using a scalpel blade. The blade is gently used to scrape the skin layers, usually until a small amount of blood appears, allowing for the collection of cells from deeper layers. After this, the skin scraping is put on a microscope slide, mixed with a few drops of 20% KOH, gently warmed, and left for a few minutes. A cover slip is then placed on top, pressed down, and the slide is examined under low and high power with dimmed light. Additionally, for the dermatological assessment, a special clinical score designed for dogs (Bernigaud *et al*., 2016) is used. This score rates various signs from 1 to 3, with 3 being the most severeThis assessment gauges the extent of mange-induced skin lesions, evaluating the severity of alopecia, erythema, and the formation of crusts or scales across distinct anatomical regions, including the head, limbs, tail, and trunk. Concurrently, comprehensive patient profiles were compiled, documenting historical data, age, sex, and environment, alongside specific clinical presentations such as otic pruritus, head shaking, inflammation, ulcerations, aural discharge, and discomfort (Arlian and Morgan, 2017; DeCandia *et al.*, 2019; Tsakok *et al.*, 2019).

Statistical Analysis: Information regarding breed, sex, age, and clinical features matching Canine Acariasis and Otitis externa was collected for all enrolled dogs. Statistical processing was performed using SPSS version 23 (IBM, 2015). To determine significant differences between groups, the Chi-square test was applied ($P < 0.05$). For paired longitudinal data, the Wilcoxon Signed-Rank test was employed to assess changes in clinical severity scores between the pre-treatment and post-treatment phases (Wilcoxon, 1945; Dawson & Trapp 2004).

Results

Clinical Signs: From May 2025 to February 2026, 50 domestic dogs of varying ages, sexes, and breeds presenting with cutaneous lesions were clinically evaluated across Diyala Province. Of these, 40 dogs were diagnosed with canine acariasis, manifesting as localized (*n*=25) or generalized (*n*=15) infestations. Concurrently, 25 cases displaying clinical signs of otitis externa characterized by head shaking, otic pruritus, dark brown ceruminous discharge, erythema, and inflammation of the external ear canal were selected for further investigation. Out of ten documented cases of dermatomycosis-infected skin lesions, five were attributed strictly to *Dermatophyte* spp., while the remaining five presented as polymicrobial infections involving both *Alternaria* spp. and *Aspergillus* spp. Concurrently, the clinical severity of canine acariasis (CAI) was evaluated using a three-tier scoring framework. Score 1 denoted minor, scattered

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areas of scaling presenting without dermal thickening or hyperpigmentation. Score 2 was assigned to localized zones displaying hyperpigmentation, crusting, or skin thickening. Finally, Score 3 signified extensive regions of markedly thickened, heavily crusted dermis accompanied by a pungent odor and epidermal debris sloughing from the skin or hair shafts (Fig.1:a–g).

Figure 1 (a–g). Clinical presentations of canine acariasis and associated dermatopathies. (a) Generalized demodicosis in a Boxer exhibiting severe erythema, alopecia, folliculitis, furunculosis, pustules, and heavy crusting (Score 3). (b) Sarcoptic mange (*Sarcoptes scabiei*) in a German Shepherd, characterized by regional patches of crusted, thickened, and hyperpigmented skin alongside chronic, progressive pruritus and secondary folliculitis (Score 2). (c, d) Otodectic mange (*Otodectes cynotis*) in a German Shepherd; the caudal margin of the left pinna displays prominent, thick brownish-to-blackish crusts and erythema. (e) Sarcoptic mange in a canine patient presenting with intense pruritus, dermatitis, alopecia, and crusting. (f) Localized demodicosis in a mixed-breed dog showing isolated patches of alopecia, folliculitis, pustules, and crust formation. (g) Mixed infection of sarcoptic mange and otitis externa in a mixed-breed dog; the right pinna exhibits localized erythema, alopecia, pustules, thick brownish crusting, and mild inflammation (Score 1).

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Direct microscopic examination of 50 samples from dogs with skin lesions and otitis externa revealed an 80.0% (40/50) acariasis infection rate. Among the 40 positive cases, *Sarcoptes scabiei*
predominated at 45.0% (18/40), followed by *Demodex canis* at 30.0% (12/40) and *Otodectes cynotis* at 25.0% (10/40), showing no statistically significant variation (Tables 1, 2).
Morphologically, three genera were confirmed (Fig. 2:a,b,c,d): (A): cigar-shaped *D. canis* with stumpy legs; (B): large-bodied *S. scabiei* with a terminal anus and short pedicels; and (C)*O. cynotis* characterized by short, unjointed pedicels on its anterior legs. (D): Mixed infection *Sarcoptes scabiei* and *Otodectes cynotis* of a German shepherd dog suffering severe infection.

Figure 2 (a–d). Microscopic diagnostic features of canine parasitic mites. (a) *Demodex canis* isolated from a canine host, displaying its characteristic elongated, "cigar-shaped" morphology and four pairs of short, stumpy limbs. (b) *Sarcoptes scabiei* presenting its typical small, sub-circular, whitish body (measuring 0.2–0.5 mm in length); mature adults exhibit four pairs of short limbs, with the sucker-bearing pairs featuring unjointed stalks (pedicels). (c) Morphological distinctions of *Otodectes cynotis*, highlighting the short, unsegmented pedicels located on the primary and secondary leg pairs of the female, alongside a male specimen demonstrating distinct suckers present across all four leg pairs.(D): Mixed infection *Sarcoptes scabiei* and *Otodectes cynotis* of a German shepherd dog suffering severe infection.

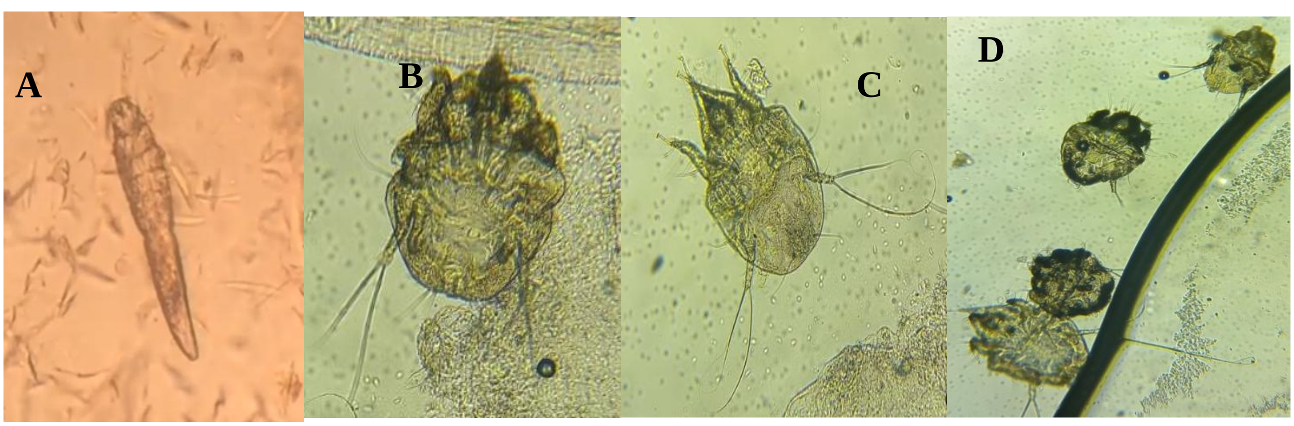

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Table 1: Infection rate of Canine acariasis infestation (CAI) in domestic dogs

Categories	NE	Positive for CAI (%)	Localized CAI (%)	Generalized CAI (%)	Otitis externa
Acariasis genes (Demodex,Sarcoptes,Otodectes)	50	40 (80%)	25 (62.5%)	15 (37.5%)	25 /50 50%
NE= Number examined, CAI = Canine acariasis infestation X^2= 2.50, *p*-value= 0.113 NSD. at P<0.05					

Table 2: Genes and species of Canine acariasis infestation (CAI) in domestic dogs

Genes and species of CAI	NE	Number of Positive & infection rate (%)
Sarcoptes scabiei	40	18 (45%)
Demodex canis		12 (30%)
Otodectes cyotis		10 (25%)
X^2= 2.60, *df=2* *p*-value= 0.275 NSD. at P<0.05		

Influence of sex on Infection rate Canine acariasis infestation.

Investigation into the host risk factors revealed a descriptively higher canine acariasis infestation rate in females (**90.0%**; 18/20) compared to males (**73.3%**; 22/30). However, chi-square analysis confirmed that this variation was statistically non-significant ($p > 0.05$), indicating that host sex does not significantly influence the distribution of CAI within the studied population (Table 3).

Table 3: Influence of sex on Infection rate Canine acariasis infestation (CAI).

Sex	N.E	Positive to CAI	Infection rate %
Male	30	22	73.3%
Female	20	18	90%
Total	50	40	80 %
X^2= 2.083 *p*-value= 0.148 NSD. at P<0.05			

* NE , Number examined, X2= Chi-square , *p*-value= Probability value , NSD= No Significant difference

Influence of age groups on Infection rate of Canine acariasis infestation (CAI).

Analysis of age-related prevalence revealed a higher infestation rate in younger dogs aged 3–12 months (**85.0%**; 34/40) compared to the older age cohort of 4–7 years (**75.0%**; 7/10). This variation, however, was statistically non-significant ($p > 0.05$), demonstrating that host age did not significantly affect the distribution of canine acariasis within the sample (Table 4).

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Table 4: Influence of age groups on Infection rate of Canine acariasis infestation.

Age	N.E	Positive to CAI	Infection rate %
Less than one year	20	17	85 %
1-3 years	18	14	77.8 %
4-7 years	12	9	75 %
Total	50	40	80 %
X^2= 0.556, *p*-value= 0.757 NSD. at P<0.05			

Influence of breed on infection rate of CAI.

Influence of breed-specific distribution revealed that German Shepherds and Boxers exhibited the highest susceptibility, with infestation rates of **86.7%** (13/15) and **84.6%** (11/13), respectively. In contrast, a lower prevalence of **66.7%** (16/24) was recorded among local breeds. Statistical analysis, however, showed no significant difference among the examined breeds ($p > 0.05$) (Table 5).

Table 5 : Influence of breed on infection rate of CAI

Breed of dogs	N.E	Positive to (CAI)	Infection rate %
German Shepherd	15	13	86.7%
Belgian	10	8	83 %
Boxer dog	13	11	84.6 %
Domestic local dogs	12	8	66.7 %
Total	50	40	80 %
X^2= 3.985, *p*-value= 0.263 NSD. at P<0.05			

Relationship of treatment with topical acaricide of infected dogs with CAI.

According to (Table-6) The statistical evaluation using the Wilcoxon Signed-Rank Test revealed a highly significant reduction (Z = -4.78, P < 0.001) in the severity scores of clinical signs in dogs following the treatment with topical acaricide **(**selamectin, moxidectin, ivermectin, and isoxazolines) compared to their pre-treatment status. Clinically, severe cases (Score 3) dropped dramatically from 25.0% to only 5.0%. Most notably, 75.0% of the infected animals (30 out of 40) achieved complete clinical resolution (Score 0) post-treatment. These findings statistically confirm the high therapeutic efficacy and potency of the administered treatment in alleviating the clinical burden of CAI.

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Table 6: Statistical analysis of clinical signs severity scores before and after treatment using Wilcoxon Signed-Rank Test (*n*=40)

Clinical signs severity	Before treatment (%) Of 40 cases	After treatment (%) Of 40 cases	Wilcoxon (Z-value)	*P-value*	SD
Score3 (Sever)	10 (25%)	2 (5 %)			
Score2 (Moderate)	12 (30%)	3 (7.5 %)	-4.78	P<0.0 01	SD
Score1 (Mild)	18 (45%)	5 (12.5 %)			
Score 0	0				
CAI positive for Direct microscopic examination	40 (100%)	10 (25 %)			

Therapeutic Response Evaluation:

The post-treatment clinical monitoring of animals affected with CAI (*n* = 40) demonstrated an excellent overall therapeutic response. The majority of treated animals achieved a Complete recovery rate of 70.0% (28/40), followed by a Partial improvement observed in 30.0% (12/40) of the cases, whereas no animals showed No response (0.0%). Application of the Chi-Square Goodness-of-Fit test revealed a highly significant difference (X^2 = 29.6, df = 2, P < 0.01) among the response categories. This statistical outcome strongly confirms that the clinical recovery and improvement rates were not random, validating the high therapeutic efficacy of the treatment protocol adopted in this study against CAI as (Table 7).

Table 7: Percentage of recovery of CAI treated by topical acaricide**.**

Categories	NE	Positive for CAI	(%)
Complete recovery	50	28	70%
Partial improvement		12	30%
No response		0	
Total		40	80%
X^2= 29.6 , *p*-value= 0.00001 *df* =2, SD. at P<0.01			

Discussion

Canine acariasis infestation (CAI) is a parasitic skin disease and a contagious skin disease caused by mite infestations (*Sarcoptes*, *Demodex* and *Otodectes genes*) characterized by crusty, pruritic dermatitis and hair loss, and caused by a variety of parasitic mites burrowing in or living on the skin. Breed could not be interpreted in our study, since most dogs were common or crossbreeds. The results showed a very high infection rate out of 50 dogs 40 cases were found

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to be infected with (25 (62.5%) localized and 15 (37.5%) generalized mite infestation) 25/50 (50%) cases with otitis externa severity for skin condition of Canine acariasis infestation (CAI) represented as score 1: Skin not thickened or pigmented, areas of scaly skin small and diffuse.Score 2: Patches of thickened, crusted, or black pigmented skin, and score 3: large areas of thickened, crusted skin; debris flaking from skin or on hair shafts; strong odor. Three genes of acariasis recorded represented *Demodex canis*12 (30%), *Sarcoptes scabiei* 18 (45%) and *Otodectes cynotis*10 (25%). The high rate of ear mite infections shows that it's a common parasitic issue for dogs in this area. This situation might be due to factors like dogs being close together, not keeping things clean, and not having regular check-ups with a vet. All these things help the parasites spread. A similar occurrence of the mite in dogs was mentioned before by Degi and others. 2010; Akter, 2016). This study included 40 dogs, which is close to the epidemiological study by Feather and others in 2010.

Diagnosis of canine acariasis (CAI) relies on skin scraping analysis; however, a primary diagnostic challenge is the low concentration of mites typically recovered from sample sites (Miller *et al.*, 2012). While our clinical grading methods for evaluating alopecia, erythema, crusts, and scales align with established methodologies, the specific scoring system applied here offered a distinct approach to quantifying the spatial distribution of scabies lesions. A notable limitation of this study was the exclusion of a pruritus intensity index a parameter heavily recognized as a critical indicator of sarcoptic mange progression and clinical severity in canine patients (Becskei et al., 2016; Beugnet *et al*., 2016; Romero *et al.*, 2016; Taenzler *et al.*, 2016; Hampel *et al.*, 2018). Additionally, the spatial distribution patterns of positive otic samples correlated directly with the severity of the overall parasitic load.

Demographic analysis revealed that canine acariasis (CAI) spanned across all evaluated breeds, sexes, and age intervals, indicating that host vulnerability is not strictly bound to a particular breed line. However, identifying predisposing elements remains vital for optimizing the diagnosis, therapy, and overall management of these parasitic infestations. When evaluating age, breed, and sex within our study cohort, age emerged as a highly significant recurrent variable. Infestation rates peaked in animals under one year of age at 85%, compared to 75% in the 4–7 year age bracket. These patterns align closely with historical data (Feather *et al.*, 2010; Chen *et al.*, 2014) and reflect the typical vertical transmission route from infected dams to their offspring, making animals under twelve months particularly vulnerable (Gross *et al*., 2008; Salib & Baraka, 2011).

Consequently, juvenile status (under one year) was statistically flagged as a key risk factor for otic mite colonization in this research. Gender distribution also yielded notable insights; positive diagnoses were confirmed in 73.3% of the examined male cohort, whereas the female cohort exhibited a substantially higher incidence rate at 90%. This variation corroborates prior literature designating biological sex as a predisposing influencer in the acquisition of canine acariasis (Curtis & Paradis, 2003; Feather et al., 2010).Whenever, Some earlier studies found that both male and female dogs can be affected by Otodectes cynotis infestation (Souza et al., 2008) and other research reports indicated that the sex of the cat does not influence whether they get infested with ear mites (Topala et al., 2007).

Regularly deworming pets is linked to a decrease in the presence of external parasites (Baker et al., 2021). Using a mix of wide-ranging anthelmintics is very effective against the main external and internal parasites that affect dogs (Baker et al., 2021). A total of 70% of the treated dogs fully recovered, 30% showed partial improvement. These results show that the overall success rate for treatment is over 95% when we take into account both complete and partial responses. The low rate of treatment failure can be linked to reasons like a high number of parasites, getting reinfested, not using the treatment correctly, or differences in how people respond to the medication. Still, the high recovery rate shows that topical acaricides are a good first choice for treating ear mite infestations in dogs. The noticeable improvement in the patient's condition was also backed up by a significant decrease in the related symptoms.The difference between how much patients improve and the total removal of parasites in a small number of cases might indicate that some inflammation remains, even after reducing the number of parasites. These results show that we need both clinical and laboratory tests to properly judge how well a treatment is working (Baker et al., 2021, Phuong et al., 2025).

Recommendations: Epidemiological and Molecular identification and sequencing of Sarcoptes ,Demodex and Otodectes genes in dogs and cats should be conducted to better understand the genetic variations in Diyala province.

Ethics approval: The Scientific Ethical Committee of the College of Veterinary Medicine, University of Diyala, Iraq, approved this study (Approval no: Vet Medicine (237); Jan, 2026, T).

Authors' Contribution: Dr.Tareq Rifaaht Minnat conceived and designed study, maintained the animals throughout the study period, collected the samples, performed the statistical analysis of the data, and drafted the manuscript. Veterinarians colleague have helped to collected the samples in different area of study. The manuscript was reviewed and edited the final version was approved collectively by author.

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