A Case Report of infestation with *Sarcoptes scabiei* (Family: Sarcoptidae) in a stray dog, Shahriar city, Tehran province, Iran

1. **Yagoob Garedaghi***

Affiliation: Department of Parasitology, Faculty of Veterinary Medicine, Tabriz Medical Sciences, Islamic Azad University, Tabriz, Iran

Email: yagoob.garedaghi@gmail.com

ORCID: https://orcid.org/0000-0003-2976-2706

2. Alireza Ghorbani (MSc Student)

Affiliation: Department of Pathobiology, Faculty of Veterinary Medicine, Bu-Ali Sina University, Hamedan, Iran

Email: alireza.ghorbani7899@gmail.com

ORCID: https://orcid.org/0009-0001-0205-8818

3. Erfan Darmanloo (MSc Student)

Affiliation: Department of Clinical Sciences, Faculty of Veterinary Science, Bu-Ali Sina University, Hamedan, Iran

Email: erfandarmanlo@gmail.com

ORCID: https://orcid.org/0009-0003-4647-4383

***Corresponding Author: Yagoob Garedaghi *(DVM, PhD)**

Email: yagoob.garedaghi@gmail.com

ORCID: https://orcid.org/0000-0003-2976-2706

Abstract

Sarcoptes scabiei is one of the most impactful external parasites in mammals, especially in dogs, and its spread has been widespread globally. Considering that this parasite is capable of being transmitted to humans, it holds significant value for examination. Today, with the increase in the number of stray dogs in urban areas, particularly on the outskirts of cities, controlling this parasitic disease in dogs is highly

emphasized. In January 2024, a three -year-old female dog in Shahriar city, Tehran province, was observed with skin disorders and hair loss in areas such as the abdominal region, flanks, limbs, and certain parts of the neck. Following initial examinations of the animal's skin lesions, skin-scraping samples were taken. The examination of skin scraping samples from the surface of the animal's body under the microscope at the parasitology laboratory showed that this stray dog was infested with the microscopic external parasite *Sarcoptes scabiei*. Such research helps us identify predominant species of external parasites and implement more precise health controls in areas. Shahriar, being one of the cities near Tehran with a high population density, can be significantly affected by parasitic diseases. Therefore, due to the large population of humans and dogs in Shahryar city, it is very important to recognize and control zoonotic diseases in this area.

Keywords: Case Report, *Sarcoptes scabiei*, stray dog, Shahriar city, Iran.

1. Introduction

1.1. Overview

Mites are microscopic external parasites that can cause skin disorders in mammals (1). *Mites* , as a notorious and contagious external parasite found worldwide, has several species, including *Demodex*, *Otodectes*, *Psoroptes*, and *Sarcoptes*, which can infest a wide range of animals such as cats, dogs, rabbits, and even humans (2). Dogs are one of the animals susceptible to Scabies infection. One of the most significant Scabies infestation in dogs is caused by *Sarcoptes scabiei*, which, due to its highly non-specific nature, can easily spread through skin contact (3). *Sarcoptes scabiei* penetrates its host's skin by creating tunnels under the host's epidermis, leading to itching, burning, redness, and inflammation of the skin surface, as well as secondary skin diseases (4).

1.2. Classification and morphology

Sarcoptes scabiei belongs to the Phylum *Arthropoda*, Class *Arachnida*, Order *Sarcoptiformes*, Family *Sarcoptidae*, Genus *Sarcoptes*, and Species *Sarcoptes scabiei* (Table 1) (5).

Table 1 – Taxonomy of Sarcoptes scabiei parasites

Taxonomic unit	Parasitic group name
Kingdom	Animalia
Phylum	Arthropoda
Class	Arachnida
Order	Sarcoptiformes
Family	Sarcoptidae
Genus	Sarcoptes
Species	Sarcoptes scabiei

Adult *Sarcoptes scabiei* have an oval-shaped body with a smooth ventral side and a convex dorsal side. Larvae of Sarcoptes scabiei have six legs, while nymphs and adults have eight legs. *Suckers* are present on the first and second pairs of legs in both males and females, but suckers on the fourth pair of legs are present only in males. These suckers help them grip the substrate during movement. The size of female *Sarcoptes scabiei* ranges from 315 to 470 micrometers in length and 225 to 345 micrometers in width, while male Sarcoptes scabiei measure between 205 and 245 micrometers in length and 145 to 170 micrometers in width(6). Since the life cycle of *Sarcoptes scabiei* occurs entirely on the host's skin, mating of adult males and females initiates the life cycle on the skin surface. After mating, the male dies, and the female begins to create tunnels in the epidermal layer of the skin (7). Burrowing at a rate of 2-3 millimeters per day. Egg-laying occurs at a rate of 1-3 eggs per day within these burrows for about two months. Each female has its own burrow where only its eggs and feces are located. The eggs hatch into six-legged larvae within 2-3 days, then the larvae migrate to the skin surface and molt into eight-legged protonymphs within 3-4 days, then into tritonymphs within 2-3 days, finally molting into adult males or females. Overall, the process from egg to adulthood takes about 14 days (8, 9).

2. Case Presentation

2.1. Study area

Because the geographic location of the study area is important in the prevalence of parasites, that's why we briefly mention the location of Shahriar city.

Shahriar district with coordinates (35° 36′ 0″ N, 51° 5′ 0″ E) is a densely populated area with a population of 744,210 people in the west of Tehran province. The area of Shahryar area is 340 square kilometers, which is connected to Qods city from the north, Baharestan and Robat Karim from the south, Tehran and Eslamshahr from the east, and Mallard from the west. This area is 1140 meters from the sea level and with an average temperature of 10 degrees Celsius; it is one of the areas with good weather in Tahan province (**Fig 1**). Due to its proximity to the capital of Iran, Shahriar region is one of the most important regions.

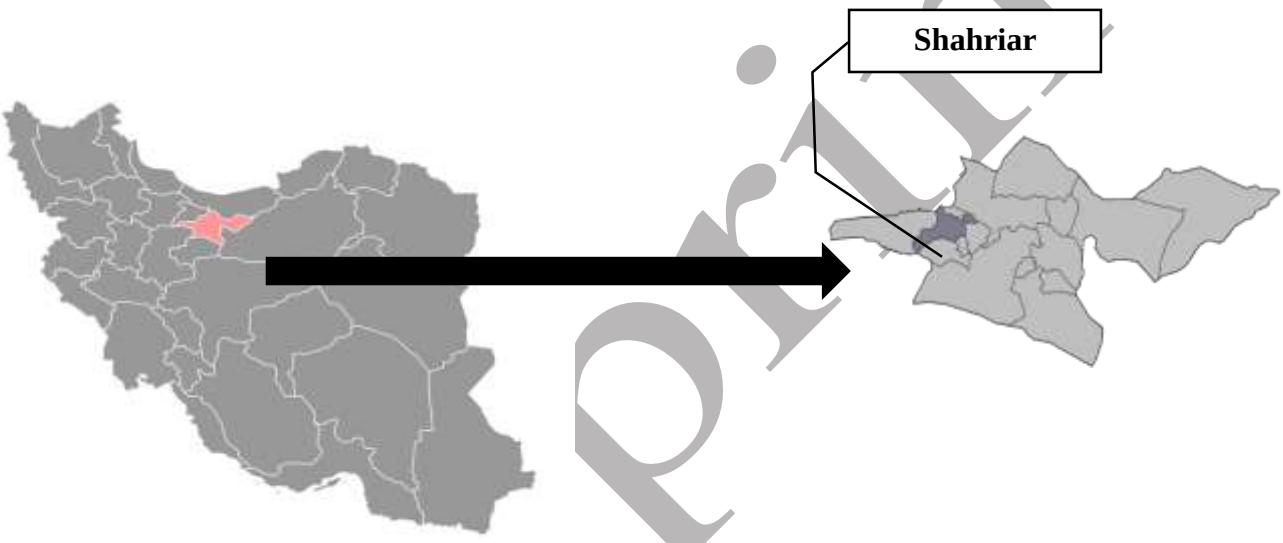

Fig 1 – Map of Iran showing the location of Tehran province and Shahriar region**.**

2.2. Data collection and diagnosis of *Sarcoptes scabiei*

After observing a stray dog of Khorasani breed displaying symptoms such as itching and hair loss, the possibility of scabies infestation was considered. Subsequently, the animal's age was calculated using dental formula. For sampling, scraping was performed on five areas of the dog with more severe itching using a scalpel blade soaked in oil, and the obtained skin scrapings were sent to the parasitology laboratory (**Fig 2**). The skin scrapings were then placed in 10% potassium hydroxide solution and heated over a Bunsen burner for about 30 minutes in a water-containing vessel. After the skin scrapings dissolved, they were

centrifuged for 2 minutes, and the resulting sediment was examined under a microscope to determine the presence of *Sarcoptes scabiei* (10).

Fig 2 – The body surface of an infected stray female dog observed in the city of Shahryar**.**

After the initial observation and examination of a 3-year-old female dog with symptoms such as itching, hair loss, and redness of the skin surface, a skin scratch sample was taken from the animal in accordance with the hygiene principles and was transferred to the parasitology laboratory. After examining the samples, the parasite was examined under a microscope from different angles, and *Sarcoptes scabiei* parasite was identified and confirmed using diagnostic keys (**Fig 3**).

Fig 3 – *Sarcoptes scabiei* isolated from the body surface of an infected female dog**.**

3. Discussion

Parasitic diseases are one of the most important infectious diseases in the world that can make millions of people and animals sick every year (11). Ectoparasites are one of the common parasitic diseases that have a global distribution that can affect different animals and even humans. Dogs are the creatures that have the most contact with humans, and this closeness can cause the transmission of common diseases between humans and dogs. *Sarcoptes scabiei* is an ectoparasite that affects mostly domestic and young dogs and is considered to have global distribution (12). Considering that Sarcoptes scabiei is known as a common disease between humans and animals and after contact between humans and infected animals up to 50% can cause skin lesions in humans who are infected with this parasite, but this parasite in The skin of the human body cannot reproduce and loses its life cycle in the human body, that's why people who are infected with Sarcoptes scabiei recover after treating the infected dog (13, 14). It can be said that Sarcoptes scabiei is one of the dominant species of scabies in Iran, according to Minabaji et al., sampling was conducted on 460 dog collars in Mashhad city between 2017 and 2018, and 2.17% of *Sarcoptes scabiei* cases were identified. In 2012 to 2013, Mirani et al. examined 138 dog collars in Ghilanegharb of Kermanshah province, and it was found that the rate of infection with *Sarcoptes scabiei* in dogs in this area was 15.33% (15-20). There is also a possibility that the fauna of dog scabies in Shahriar region in Tehran province is also *Sarcoptes scabiei*. Increasing marginalization and poor management of stray animals in cities has become one of the most important health problems of different countries, especially tropical and subtropical countries. External parasites are one of the most important diseases that can pose a threat to human societies and cause health and even economic damage. Increasing human health and care training in dealing with stray animals and even owners will prevent many diseases.

Acknowledgment:

We would like to thank from all the people who contributed in this research.

Authors' Contribution

Study concept and design: G.A, G.Y

LAK Acquisition of data: G.A, D.E

Analysis and interpretation of data: G.A, G.Y

Drafting of the manuscript: G.A

Critical revision of the manuscript for important: G.Y

Intellectual content: G.Y, G.A and D.E

Statistical analysis: G.A, G.Y

Ethics: All principles of medical ethics have been observed in this study.

Conflict of Interest: The authors declare no competing interests.

Funding: Not applicable

References

1. Pence DB, Ueckermann E. Sarcoptic manage in wildlife. Revue scientifique et technique (International Office of Epizootics). 2002 Aug 1; 21(2):385-98.
2. Aghazadeh H, Rigi A, Sangchooli T, Taheri P, Nasiraei AH, Mohammadi M. A New Herbal Medicine Formulation with Potential Anti-scabies Properties to Treat Demodex and Sarcoptes Parasites. Archives of Razi Institute. 2023 Oct 1;78(5):1472-82.doi: 10.32592/ARI.2023.78.5.1472

3. Thomsett LR. Structure of canine skin. British veterinary journal. 1986 Mar 1; 142(2):116-23. doi: 10.1016/0007-1935(86)90086-2

4. Beck W, Hora F, Pantchev N. Case series: Efficacy of a formulation containing selamectin and sarolaner against naturally acquired mite infestations (Demodex sp., Ornithonyssus bacoti) in degus (Octodon degus). Veterinary Parasitology. 2021 May 1; 293:109430. doi: 10.1016/j.vetpar.2021.109430

5. Zhang ZQ. Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness. Magnolia press; 2011.

6. Cosoroabă I. Tratat de Medicină Veterinară, Volumul VI, Secțiunea a XII-a: Parazitologie Veterinară, Râile (Scabiile). Ed. Risoprint, Cluj-Napoca. 2014:973-1026.

7. Taylor MA, Coop RL, Wall R. Veterinary parasitology. John Wiley & Sons; 2015 Dec 3.

8. Arlian LG, Vyszenski-Moher DL. Life cycle of Sarcoptes scabiei var. canis. The journal of Parasitology. 1988 Jun 1:427-30. doi:10.2307/3282050

9. Mindrur R, Roman C, Miron LD, Irimiciuc S, Ghizdovat V. Case Study of a Severely Infected Dog with Sarcoptes scabiei Mites and The Mathematical Study of The Interactions between Mites and Host. Buletinul Institutului Politehnic Din Iasi. 2019; 65(69):57-67.

10. Mosallanejad B, Alborzi AR, Katvandi N. A survey on ectoparasite infestations in companion dogs of Ahvaz district, south-west of Iran. Journal of arthropod-borne diseases. 2012; 6(1):70.

11. Ghorbani A. An overview of the science of parasitology simply for the general public. Int J Med Parasitol Epidemiol Sci Volume. 2023;4(1):13. doi: 10.34172/ijmpes.2023.03

12. Russell RC, Otranto D, Wall RL. The encyclopedia of medical and veterinary entomology. CABI; 2013.

13. Beugnet F, de Vos C, Liebenberg J, Halos L, Larsen D, Fourie J. Efficacy of afoxolaner in a clinical field study in dogs naturally infested with Sarcoptes scabiei. Parasite. 2016; 23. doi: 10.1051/parasite/2016026 A

14. Diwakar RP, Diwakar RK. Canine scabies: a zoonotic ectoparasitic skin disease. Int. J. Curr. Microbiol. Appl. Sci. 2017; 6(4):1361-5.

15. Minabaji A, Moshaverinia A, Khoshnegah J. Frequency of ectoparasite infestation in dogs in Mashhad, northeast Iran. 2020 Sep 22;75(3):280-7 doi: 10.22059/jvr.2019.274542.2894

16. Mirani F, Yakhchali M, Naem S. A study on ectoparasites fauna of dogs in suburbs of Ghilanegharb, Kermanshah province, Iran. 2017 Mar 21;72(1):7-14.:doi 10.22059/JVR.2017.61285

17. Yagoob, Garedaghi. Flea infestation in farm animals and its zoonotic importance in East-Azerbaijan province. American Journal of Animal and Veterinary Sciences, 2011:6(4):192-195.

18. Yagoob, Garedaghi, Safar Mashaei, S. Prevalence of gastrointestinal helminthic infestation in pet and stray dogs in Tabriz (East-Azerbaijan province), Iran. Journal of Animal and Veterinary Advances, 2011: 10(11):1477-1479.

19. Garedaghi, Yagoob, Mashaei, S.S. Parasitic infections among restaurant workers in Tabriz (East-Azerbaijan province) Iran. Research Journal of Medical Sciences, 2011:5(2):116-118

20. Garedaghi Yagoob. A case-report of Sarcoptes scabiei var. hominis in a 55-year-old male sheepherder in Tabriz, Iran. Indian Journal of Fundamental and Applied Life Sciences. 2014 Vol. 4 (3) July-September, pp.228-230.