



Assessment of Risk Factors and Incidence Rate of Sarcoptic Mange in Stray Dogs in Kabul City of Afghanistan

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Abstract:

Objectives: This study aimed to detect and assess the prevalence rate of sarcoptic mange among stray dogs in Kabul, Afghanistan, and to determine whether factors such as age, gender, and season are associated with the incidence rate.

Methods: This study was conducted from April to September 2023, involving 80 stray dogs (40 male and 40 female) collected by the Mayhew Afghanistan team from various areas in Kabul city. The dogs were brought to the animal birth control center (ABCC) for castration and spaying, and all were examined for sarcoptic mange through clinical signs, skin scraping, and identification under a light microscope. The Data was analyzed using the Chi-square test in SPSS with a significance level of $P < 0.05$.

Results: The results indicated that 21 of the 80 dogs (26.30%) were infested with sarcoptic mange. Stray dogs less than one year old had a significantly higher infestation rate (43.20%) compared to dogs older than one year (11.60%) ($P = 0.001$). Additionally, female stray dogs showed a higher susceptibility to sarcoptic mange (30.00%) than male stray dogs (22.50%), but this difference was not statistically significant ($P = 0.446$). Furthermore, the highest prevalence (34.80%) was observed in the spring compared to the summer season (14.70%) ($P = 0.044$).

Conclusions: Since this is the first study to investigate sarcoptic mange in stray dogs in Kabul city, Afghanistan, the results can provide basic information about the incidence of this disease and its associated factors throughout country. As sarcoptic mange is a zoonotic disease, controlling and preventing the population of stray dogs requires important strategies, such as awareness campaigns for citizens and treatment stray dogs, which must be considered in the future.

Keywords: Risk factors; sarcoptic mange; incidence rate; stray dogs; Kabul.

1 Introduction

Canine sarcoptic mange is a highly contagious, unseasonal, and pruritic dermatitis that affects both domestic and wild canids, and occasionally cats (Mindru et al., 2019). It impacts more than 150 species of mammals worldwide, especially dogs and humans (Khoobdel et al., 2022; Moroni et al., 2022). Among the skin-related parasitic diseases, sarcoptic mange, caused by mites, is one of the most significant due to its veterinary and public health relevance in tropical and subtropical regions worldwide (Bhowmik et al., 2024). The causative organism is an arthropod belonging to the class Arachnida, subclass Acari, order Astigmata, suborder Acaridida, and family Sarcoptidae. Several host-specific varieties have been identified within the genus *Sarcoptes* (e.g., *S. scabiei* var. *canis*, *S. scabiei* var. *bovis*, *S. scabiei* var. *suis*, *S. scabiei* var. *equi*, which infest dogs, cattle, pigs, and horses, respectively) (Villalobos et al., 2023). Sarcoptic mange, also known as *Sarcoptes scabiei* or scabies, is a condition referred to as sarcoptosis (Khoobdel et al., 2022). Furthermore, mange mites are obligate parasites, spending their entire life cycle within their host. Their life cycle consists of three stages: egg, nymph, and adult (Ali et al., 2021).

Sarcoptic mange is an emerging/re-emerging infectious disease, raising global public health concerns (Ali et al., 2021; Chen et al., 2014). The zoonotic aspect of the disease is significant, as direct interaction with an infected dog can lead to mild skin irritation in humans, accompanied by itching. However, the condition is self-resolving, meaning that the mites cannot reproduce on human skin and will eventually perish (Mindru et al., 2019). In both direct and indirect transmission of mites, several factors such as host susceptibility, mite strain, the animal's condition, and environmental conditions like temperature and humidity play a significant role (Niedringhaus et al., 2019). In 2017, the World Health Organization (WHO) classified scabies as a neglected tropical disease, emphasizing the need for increased awareness among health practitioners and organizations, as well as a global consensus on control strategies. The WHO estimates that over 200 million people are affected by scabies worldwide, although the actual prevalence is likely much higher (Khoobdel et al., 2022; Moroni et al., 2022). Therefore, *Sarcoptes scabiei* var. *canis* is a highly pruritic, non-seasonal, zoonotic parasite (Dumitrache et al., 2023). This itching results from the expulsion and discharge of living mites as they

digest host tissue during feeding and burrow into the skin (Nwufoh et al., 2019; Zineldar et al., 2023).

The clinical signs of sarcoptic mange in stray dogs include pruritic dermatitis, alopecia, hyperkeratosis, and scaling (Ali et al., 2021; Chen et al., 2014), as well as papules, erythema, scaling, and crusting (Dumitrache et al., 2023), and lichenification (Chen et al., 2014). The usual affected areas of the body are the periocular region, ear flaps, paws, and elbows, though the condition can spread to the entire body (Mindru et al., 2019).

Dogs are one of the most popular pet species worldwide, with an estimated 800 million dogs globally, of which 300 million are stray dogs. One of the major concerns associated with stray dogs is the potential transmission of sarcoptic mange to humans (Nasiry et al., 2023). The management strategies for mites include early detection of sarcoptic mange through clinical signs and skin scrapings, and treatment typically involves the administration of antiparasitic medications, such as ivermectin or selamectin. Awareness programs can encourage responsible pet ownership and management of stray populations, while spaying/neutering stray dogs can help control their population, reducing the spread of mange and other diseases (Liu et al., 2021; Niedringhaus et al., 2019).

Finally, to the best of our knowledge, no studies have been conducted in Kabul city regarding sarcoptic mange in stray dogs. This study aims to assess the role of risk factors such as age and sex in the prevalence of sarcoptic mange among stray dogs in Kabul, Afghanistan, and to record the seasonal prevalence of the disease. As this is the first study of its kind, the results will provide a foundation for controlling strategies to address sarcoptic mange infestations in stray dogs in this area and potentially across the country.

2 Materials and methods

2.1 Study Area

The study was conducted in Kabul city, located in Kabul, Afghanistan (Figure 1). Kabul is situated approximately between 34°31' N latitude and 69°12' E longitude. The city has an arid to semi-arid steppe climate, with a continental climate characterized by hot summers and cold winters. Snowfall is common during the winter months (Wikipedia, 2024). According to the National Statistics and Information Authority (NSIA), the population of Kabul city was reported to be 4.95 million in 2023.

(NSIA, 2023). However, while dog ownership as family pets is relatively uncommon in Kabul, there is a significant stray dog population on the city's streets. The stray dog population in Kabul is

estimated at around 30,000, with a density of 7.7 to 7.8 dogs per 1,000 people and 2 owned dogs per 1,000 people (Mohammadzai, 2019).

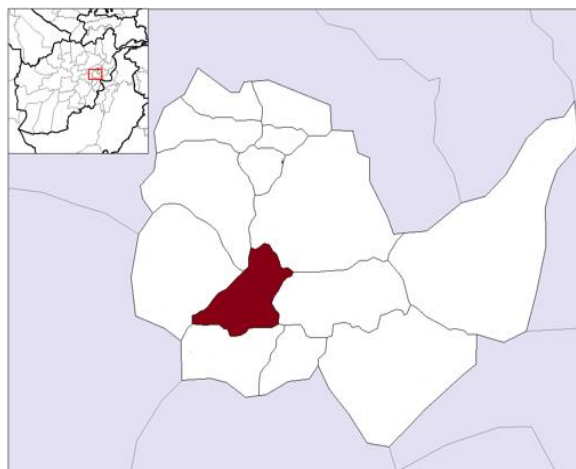


Figure 1. The red-spot in the map indicate location of Kabul city in the Kabul province, Afghanistan.

2.2 Study Population

From April to September 2023, a total of 80 stray dogs (40 female and 40 male) were collected from various areas of Kabul city by the Mayhew Afghanistan team, a non-governmental organization operating in the city (Figure 2). These dogs were brought to the Animal Birth Control Center (ABCC) for the study. The dogs were primarily collected for castration and spaying to control the birth rate of stray dogs in Kabul. The sex and age of the dogs were estimated through dental examination after sedation and anesthesia, recorded during the spring and summer seasons. Subsequently, all dogs underwent an external examination to identify dermatoses based on

clinical symptoms such as pustular and squamous skin lesions, erythema, and dermatitis (Figure 2). The suspected areas of hair loss and skin changes were marked, shaved, and cleaned. A few drops of paraffin oil were then applied to the area to prevent mite spread during skin scratching. Scraping of the affected area was performed until a drop of blood appeared on the scalpel blade (Figure 3). The scraped material was then transferred to a slide, mixed with 2–3 drops of distilled water, and spread evenly. A cover slip was placed on the slide, and the sample was examined under a microscope using 10x to 40x objectives (Figure 4) (Wall & Shearer, 1997; WOA, 2022).



Figure 2: A dog that severely infected by scabies.



Figure 3: Sampling flow from a stray dog infested with sarcoptic mange.

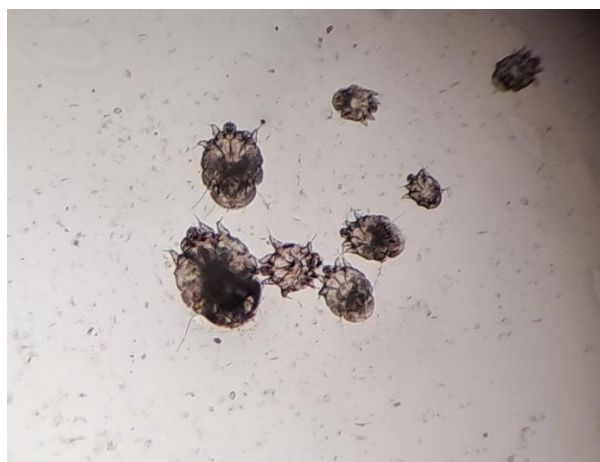


Figure 3: Fixation and identification of sarcoptic mange in a sample from an infected dog observed under a microscope at 10x magnification.

2.3 Data analysis

The prevalence of sarcoptic mange in the studied population was analyzed using the Chi-square test in the Statistical Package for the Social Sciences (SPSS, version 21), based on specific variables such as gender (male, female), age (less than 1 year and more than 1 year), and season (spring and summer). All variables with a P-value < 0.05 were considered significant.

3 Results

Skin scrapings from the 80 stray dogs were examined microscopically to confirm the presence of *S. scabiei* in suspected cases. Twenty-one dogs were found to be positive for sarcoptic mange, resulting in an overall prevalence of 26.3% among the stray dogs. The infestation rate was analyzed based on age, gender, and season.

Age: The stray dogs included in the study ranged from less than one year old to more than one year

old. Stray dogs less than one year old had a significantly higher infestation rate (43.2%) compared to dogs older than one year (11.6%) (Table 1).

Gender: Female stray dogs were found to be more susceptible to sarcoptic mange than male stray dogs. The prevalence of sarcoptic mange was higher in female dogs (30%) compared to male dogs (22.5%), although this difference did not reach statistical significance (Table 1).

Risk Factors: Regarding environmental factors, the highest prevalence (34.8%) was observed in the spring, while the lowest infection rate (14.7%) occurred in the summer (Table 1). In the spring, the prevalence rate was influenced by environmental factors such as lower temperatures and higher humidity, which favor the gathering and contact of stray dogs. Additionally, weakened immune systems due to pregnancy, lactation, or starvation increase susceptibility to infestation.

Table 1: Prevalence of Sarcoptic mange infection based on gender, age and season sampled stray dogs in Kabul city, 2023.

		Sarcoptic mange infection			x ² value	P-value
Variable		Positive (%)	Negative	Total		
Age categories	≤1 year	16 (43.2)	21	37	10.268	0.001
	>1 year	5 (11.6)	38	43		
Gender	Male	9 (22.5)	31	40	0.581	0.446
	Female	12 (30.0)	28	40		
Season	Spring	16 (34.8)	30	46	4.07	0.044
	summer	5 (14.7)	29	34		

4 Discussion

This study identified age as a significant risk factor for sarcoptic mange in stray dogs. The data revealed an overall prevalence of 26.3%, with stray dogs under one year old being the most affected, showing an infestation rate of 43.2% (16/21). This

finding aligns with previous research; for instance, Feather et al., (2010) reported a 40% prevalence in dogs younger than two years, suggesting that increased social interaction and outdoor exploration among puppies contribute to this

higher rate. Similarly, Hussain et al. (2021) found a prevalence of 28.7% in dogs under one year old, compared to 20.1% in older dogs, noting that younger dogs have less developed immune systems, making them more susceptible to mite infestations. Additionally, a study conducted in Iran reported a prevalence of 25.3% in dogs under one year and 16.4% in those over one year (Rahmati et al., 2019). The authors attributed the higher rates in younger dogs to their increased social interactions and close contact with infested older dogs in stray populations. Furthermore, a study in Tajikistan by Abdulloev et al., (2020) found a prevalence of 27.1% in dogs under one year and 18.6% in dogs over one year, suggesting that the less developed skin barriers and grooming behaviors of younger dogs contribute to their increased susceptibility to sarcoptic mange.

In our study, we found that stray female dogs were more susceptible to sarcoptic mange than male dogs, with infestation rates of 30% (12/21) and 22.5% (9/21), respectively. However, no statistically significant difference was found between the sexes. This finding is consistent with previous research. For example, Chen et al. (2014) noted that female dogs were slightly more susceptible than males (1.23% compared to 1.15%). Conversely, Hussain et al., (2021) reported that male dogs were more susceptible, with rates of 26.4% for males and 20.5% for females. A study conducted in India by Bhowmik et al., (2024) found no significant difference ($p > 0.05$) between male and female dogs, with prevalence rates of 2.40% and 1.37%, respectively.

In a study conducted in southern Nigeria, Nwufor et al., (2019) found that of 235 female dogs, 169 (71.92%) were infected with scabies, while 90 (60.40%) of 149 male dogs tested were positive. The authors suggested that the higher susceptibility in female dogs might be due to lower resistance linked to pregnancy, lactation, parturition, and increased stress.

The present investigation indicated that the prevalence of *S. scabiei* was highest in spring at 34% (16/21), compared to 14.7% (5/21) in summer. This finding is consistent with previous studies; for instance, Fazal et al. (2014) reported the highest prevalence of sarcoptic mange in winter and spring, with rates of 13.37%, 11.42%, 7.57%, and 9.87% for winter, spring, summer, and fall, respectively. A study by Bhowmik et al., (2024). Showed that the prevalence rates of *Sarcoptes* mite infestation were higher in winter (4.615%), followed by monsoon (1.327%), post-monsoon (1.11%), and pre-monsoon

(0.735%). Climatic factors undoubtedly play a role in the spread of this disease, as it is transmitted more rapidly in wet and cold weather. Dogs tend to gather in cold weather, making the disease more common in winter and spring than in summer (Chen et al., 2014; Fazal et al., 2014). Furthermore, the increased incidence during the moist season might be due to conditions that are favorable for mite reproduction.

5 Conclusion

This study found a 26.3% overall prevalence of sarcoptic mange among stray dogs in Kabul, with significantly higher rates in dogs under one year old (43.2%) compared to older dogs (11.6%). Additionally, the prevalence was higher in spring (34.8%) than in summer (14.7%). These results underscore the importance of age and seasonal factors as key risk variables for sarcoptic mange. Further research is needed to identify additional risk factors and refine management strategies to effectively control and reduce the incidence of sarcoptic mange in stray dog populations.

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