



Associations between feeding type, housing system and disease prevalence in dogs and cats at Sokoto Veterinary Clinic

LB Yahaya, H Tukur, A Aliyu, MG Hamza, D Suleiman, M Haruna & A Abdulrasheed*

Ministry of Livestock and Fisheries Development, Sokoto, Nigeria

*Correspondence: Tel.: +234 ; E-mail: rasheedabdulrauf@gmail.com

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Abstract

Pet ownership is increasing in northern Nigeria, yet limited epidemiological data exist on how feeding and housing practices influence disease patterns in dogs and cats. This retrospective study assessed the association between feeding types, housing systems, and disease prevalence among canine and feline cases presented to the Veterinary Clinic Sokoto, Aliyu Jodi Road, between 2021 and 2023. Clinical records of 2,164 cases (1,424 dogs and 740 cats) were extracted and analyzed using chi-square tests in SPSS version 29. Diseases were categorized as infectious or non-infectious, while feeding types included animal protein, table remnants, canned food and suckling. Housing systems were classified as indoor or stray. In dogs, 996 (69.9%) cases were infectious and 428 (30.1%) non-infectious, with tick infestation (39.4%) and parvoviral enteritis (9.6%) predominating. In cats, 243 (32.8%) were infectious and 497 (67.2%) non-infectious, with traumatic injuries (26.1%) and helminthosis (19.1%) most frequent. Feeding type was significantly associated with disease prevalence in dogs ($\chi^2 = 18.72$, $p = 0.004$), with table remnants accounting for the majority of infectious cases, whereas no significant association was observed in cats ($\chi^2 = 2.81$, $p = 0.729$). Housing system showed significant associations with disease type in both dogs ($\chi^2 = 6.45$, $p = 0.011$) and cats ($\chi^2 = 4.62$, $p = 0.032$). These findings highlight species-specific disease patterns and highlight the importance of improved feeding practices and housing management to reduce infectious burdens and enhance companion animal welfare in resource-limited environments.

Keywords: Cats, Disease, Dogs, Feeding, Housing

Introduction

The tie between humans and their pets, particularly dogs and cats, is widely recognised for its ability to provide emotional support and companionship. Studies have shown that dog ownership nurtures

experiences of unconditional love, enhances socialisation and promotes emotional well-being (González-Ramírez & Landero-Hernández, 2021; Gerhardt *et al.*, 2022). Outside companionship, dogs

possess exceptional olfactory and social-cognitive abilities, enabling them to perform specialised roles such as explosive detection and search-and-rescue missions (Spinella *et al.*, 2022; Lazarowski & Dorman, 2014). Similarly, cats enhance human-pet relationships through behaviours such as stroking and cuddling, which contribute to emotional engagement and stress reduction (González-Ramírez & Landero-Hernández, 2021; Bukar-Kolo *et al.*, 2018). Both species have been linked to alleviation of loneliness, though their effects on psychological distress may vary across individuals (Hardie *et al.*, 2023).

Nutrition is an important determinant of pet health, with diets directly influencing immune function, metabolic balance and disease susceptibility (Chesney, 2001). Understanding feeding practices helps veterinarians provide guidance that prevents nutritional deficiencies, obesity, dental problems and gastrointestinal infections, while also informing owners on best practices to support animal welfare (Chesney, 2001; Bosman *et al.*, 1996). Different feeding strategies deliver varying nutritional profiles that affect immune and inflammatory responses and overall health in dogs and cats (Barroso *et al.*, 2024). Adequate intake of animal protein is critical for maintaining body mass and immune function, while feeding pets on table remnants may result in nutritional imbalances (Fascetti, 2010; Adekunmi *et al.*, 2017). Moreover, diet plays a pivotal role in enhancing gut health, which plays a role in susceptibility to infectious diseases as well as chronic conditions such as allergies and dermatitis (Jaffey *et al.*, 2022). Collectively, these findings highlight the importance of research on feeding practices as a framework for promoting pet health, preventing diet-related disorders, and enhancing their overall well-being (Di Cerbo *et al.*, 2017).

Housing conditions are a critical factor influencing animal health and disease transmission dynamics in dogs and cats (Kurnosova *et al.*, 2023; Ogbonna *et al.*, 2024). For instance, stray pets are often associated with zoonotic and parasitic infections, whereas indoor pets are more commonly affected by non-infectious conditions (Kurnosova *et al.*, 2023; Ogbonna *et al.*, 2024). Epidemiological studies report high disease prevalence among stray dogs and cats, including rabies, parvovirus, distemper, mange, giardiasis and cryptosporidiosis (Sharma *et al.*, 2023; Gado *et al.*, 2023). In contrast, indoor pets, particularly cats, are prone to conditions such as periodontal disease and obesity, often linked to sedentary lifestyles and dietary factors (O'Neill *et al.*, 2023). Stress, which is common in stray animals, further compromises immunity, increasing their

susceptibility to infectious diseases and emphasising their role as potential reservoirs for zoonotic transmission (Pesavento & Murphy, 2014).

A critical gap in veterinary epidemiology exists in resource-limited environments like northern Nigeria, where pet ownership is increasing amid challenges such as a lack of commercial feeds and traditional housing systems characterised by overcrowding and poor ventilation, which facilitate high rates of diseases such as diarrhoea and respiratory infections (Bolajoko *et al.*, 2020). This study has the potential to provide evidence-based interventions, such as tailored feeding practices and improved housing conditions, that will ultimately enhance animal welfare and reduce clinical caseloads in Sokoto, Nigeria (Aiyedun & Olugasa, 2012).

Materials and Methods

Study area and data collection

This study was conducted at the Veterinary Clinic Sokoto, Aliyu Jodi Road within the Sokoto metropolis in the semi-arid region of north-western Nigeria. Geographically, Sokoto State is located between longitudes 4°8'E and 6°54'E and latitudes 12°N and 13°58'N, encompassing an area of approximately 32,000 square kilometres. As of 2019, the state had an estimated human population of 5.8 million (National Bureau of Statistics, 2020) and no available data on the population of dogs and cats (MAHF, 2012).

Data on dog and cat cases were collected from the clinical case files of the Veterinary Clinic Sokoto from 2021 to 2023. These data were analysed to assess the prevalence of infectious and non-infectious diseases under different housing systems and feeding types. The housing systems were indoor and outdoor. Feeding types included animal protein, table remnants, canned food, and suckling.

Data collection and analysis

Data were collected using Google Forms and exported to Microsoft Excel for analysis. Key variables recorded included disease diagnosis, housing system and feeding types. Chi-square test was conducted using the Statistical Package for the Social Sciences (SPSS, Version 29.0.2.0, Chicago, IL, USA) to determine the association between the housing system and feeding types and the prevalence of infectious and non-infectious diseases.

Results

A total of 1,424 canine and 740 feline cases were recorded during the study period. In dogs, 996 cases were infectious, while 428 cases were non-infectious.

In cats, 243 cases were infectious, while 497 were non-infectious. In dogs, 561 (39.40%) of the cases were diagnosed as tick infestation, followed by 136 (9.55%) parvoviral enteritis cases and 78 (5.48%) traumatic injuries. In cats, 193 (26.08%) cases diagnosed were traumatic injuries, followed by 141 (19.05%) cases of helminthosis and 83 (11.22%) cases of poisoning.

Association between the feeding types and disease prevalence

The association between feeding type and disease prevalence in dogs and cats is presented in Table 1. Among dogs, animals fed table remnants accounted for 932 infectious and 374 non-infectious cases. Dogs fed animal protein accounted for 27 infectious and 27 non-infectious cases, while those fed canned food accounted for 10 infectious and 12 non-infectious cases. Suckling dogs accounted for 10 infectious and 7 non-infectious cases, while those fed canned food combined with table remnants accounted for 10 infectious and 4 non-infectious cases. Dogs fed animal protein combined with table remnants accounted for 4 infectious and 2 non-infectious cases, while those suckling combined with animal protein accounted for 3 infectious and 2 non-infectious cases. There was a statistically significant association between feeding type and disease prevalence in dogs ($\chi^2 = 18.72$, $df = 6$, $p = 0.004$).

Among cats, animals fed table remnants accounted for 177 infectious and 373 non-infectious cases. Cats fed animal protein accounted for 12 infectious and 18 non-infectious cases, while those fed canned food accounted for 21 infectious and 49 non-infectious

cases. Suckling cats accounted for 9 infectious and 16 non-infectious cases, while those fed animal protein combined with remnants accounted for 18 infectious and 32 non-infectious cases. Cats suckling combined and fed protein accounted for 6 infectious and 9 non-infectious cases. There was no statistically significant association between feeding type and disease type in cats ($\chi^2 = 2.81$, $df = 5$, $p = 0.729$) (Table 1).

Association between housing system and disease prevalence

Among dogs, indoor animals accounted for 924 infectious cases and 412 non-infectious cases, while stray dogs accounted for 72 infectious cases and 16 non-infectious cases. There was a statistically significant association between housing and disease type in dogs ($\chi^2 = 6.45$, $df = 1$, $p = 0.011$). Among cats, indoor animals accounted for 178 infectious cases and 382 non-infectious cases, while stray cats accounted for 65 infectious cases and 115 non-infectious cases. There was also a statistically significant association between housing and disease prevalence in cats ($\chi^2 = 4.62$, $df = 1$, $p = 0.032$) (Table 2).

Discussion

The pattern of disease occurrence in this study demonstrates distinct species-specific differences with infectious diseases more prevalent in dogs and non-infectious diseases more prevalent in cats. The high prevalence of infectious diseases in dogs align with existing studies in Nigeria where cases of helminthosis, tick infestation and parvoviral enteritis has been reported as most prevalent (Shima *et al.*,

Table 1: Cross-tabulation for the association between the feeding type and the disease prevalence

Species	Feeding Type	Infectious	Non-infectious	Total	χ^2	df	p value
Canine	Table remnants	932	374	1306	18.72	6	0.004*
	Animal protein	27	27	54			
	Canned food	10	12	22			
	Suckling	10	7	17			
	Can food + remnants	10	4	14			
	Animal protein + remnants	4	2	6			
	Suckling + protein	3	2	5			
	Total	996	428	1424			
Feline	Table remnants	177	373	550	2.81	5	0.729
	Animal protein	12	18	30			
	Canned food	21	49	70			
	Suckling	9	16	25			
	Animal protein + remnants	18	32	50			
	Suckling + protein	6	9	15			
	Total	243	497	740			

Key: df; degree of freedom, p value; probability value, *Significantly different at $p < 0.05$.

Table 2: Cross-tabulation for the association between the housing system and the prevalence of infectious and non-infectious diseases

Species	Housing	Infectious	Non-Infectious	χ^2	df	<i>p</i> value
Canine	Indoor	924	412	6.45	1	0.011*
	Stray	72	16			
Feline	Indoor	178	382	4.62	1	0.032*
	Stray	65	115			

Key: df; degrees of freedom, *p* value; probability value, *Significantly different at $p < 0.05$.

2015). However, the high prevalence of non-infectious cases such as trauma and poisoning cases in cats aligns with some global and regional studies that demonstrate the effect of penetrating and blunt injuries, which are often associated with environmental hazard (Gregory *et al.*, 2023). These contrasting patterns may reflect differences in exposure and behaviour between the two species, with dogs being more susceptible to infectious and ectoparasitic diseases through environmental exposure, while cats, particularly those allowed to roam freely, may have greater exposure to physical hazards that increase the risk of trauma and poisoning (Abdulkareem *et al.*, 2018). Thus, these patterns highlight the need for targeted interventions in dogs such as routine tick treatment and deworming, as well as the prevention of trauma and toxin exposure among cats (Hasib *et al.*, 2020).

The association between feeding types and disease prevalence revealed that table remnants, which are often nutritionally inconsistent and contaminated, dominate both infectious and non-infectious disease conditions (Davies *et al.*, 2019). A chi-square analysis also revealed a statistically significant relationship, which suggests that irregular human-derived food increases the risk of *Salmonella* infection as well as causes immune dysregulation (Groat *et al.*, 2022). However, a more controlled diet, such as canned food or a protein-based diet, shows lower prevalence, which aligns with veterinary principles that processed diets reduce the risk of disease susceptibility, though exceptions exist in suckling puppies due to developmental vulnerabilities (Serhan *et al.*, 2022). These findings are concurrent with other studies that highlighted that home-made diets which are analogous to table remnants are associated with gastrointestinal infections in dogs, whereas commercially prepared diets are associated with reduced enteropathies (Ortiz *et al.*, 2025).

The lack of a statistically significant relationship between feeding types and prevalence of diseases in cats contrasts with findings in existing literatures where table remnants have been shown to be

associated with elevated infectious diseases due to microbial contamination such as *Salmonella* and *Campylobacter* (Davies *et al.*, 2019). However, the predominance of non-infectious cases in various feeding types suggests multifactorial etiologies such as genetics, age and environmental factors, which dominate cat morbidity (He *et al.*, 2022). These findings highlight the need for further studies to evaluate the effect of other factors, such as diet quality and hygiene, and to establish the impact of feeding types on disease prevalence in cats (Buffington, 2008).

The statistically significant relationship between housing system and prevalence of diseases in dogs, as well as higher counts of infectious and non-infectious diseases in indoor dogs agree with some existing studies (Gettings *et al.*, 2023). Some literature has attributed a higher prevalence of diseases in indoor dogs to their close confinement, which facilitates disease transmission in shared spaces and incomplete vaccination protocols, which contrasts with stray dogs that benefit from natural immunity and lower density (Silva *et al.*, 2025). Other studies have shown that stray dogs are more prone to vector-borne diseases such as heartworm and *Ehrlichia* spp. when compared to indoor dogs (Gettings *et al.*, 2023).

Similarly, in cats, there is a statistically significant relationship between housing system and disease prevalence, and there are higher counts of non-infectious diseases in indoor cats compared to stray cats, which aligns with existing studies (Wagner *et al.*, 2018). These patterns suggest that indoor cats may be predisposed to non-infectious conditions such as obesity, stress and limited physical activity in confined environments when compared to stray cats that have free mobility (Foreman-Worsley *et al.*, 2021). The mobility of stray cats may also predispose them to outdoor pathogens, which may elevate the risk of infectious diseases, which is consistent with a study linking high-density cat populations to upper respiratory tract infections (Candela *et al.*, 2022).

This study demonstrated distinct patterns in disease prevalence among dogs and cats presented to the

Veterinary Clinic Sokoto between 2021 and 2023. Infectious diseases predominated in dogs, particularly tick infestation and parvoviral enteritis, whereas non-infectious conditions, notably traumatic injuries and poisoning, were more common in cats.

A statistically significant association was observed between feeding type and disease prevalence in dogs, with animals fed table remnants accounting for the majority of both infectious and non-infectious cases. This finding highlights the potential health risks associated with nutritionally inconsistent and possibly contaminated diets. In contrast, no significant association was detected between feeding type and disease prevalence in cats, suggesting that feline morbidity may be influenced by multifactorial factors beyond diet alone.

Housing system was significantly associated with disease prevalence in both species. Indoor dogs and cats recorded higher overall case numbers, with infectious diseases more common in dogs and non-infectious conditions more frequent in cats. These findings highlight the complex interplay between nutrition, housing and species-specific risk factors in shaping disease patterns. Overall, the study provides evidence-based insights to guide targeted interventions, including improved feeding practices, enhanced housing management, routine preventive care and owner education, to promote pet health and reduce clinical caseloads in Sokoto and similar resource-limited environments.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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