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Research Article

Epidemiological Assessment of Health Status of Owned and Free-Roaming Dogs in Juba County, South Sudan

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Abstract

Background: Dogs play a critical role in public health as potential reservoirs for Zoonotic diseases. However, data on their health status in South Sudan remain scarce.

Objective: This study aimed to determine the population structure and health status of owned and free-roaming dogs in Juba County, South Sudan, and to assess the prevalence of major diseases and parasites.

Methods: A cross-sectional survey was conducted in six locations of Juba County—Gudele, Gurei, Gumbo, Juba, Kator, and Munuki. Examination was performed on 3,051 owned dogs and 194 free-roaming dogs to record sex, age, and health conditions. A subset of 39 dogs underwent thin blood smear examination for hemoparasites. Statistical comparisons between groups were performed using the Independent Samples t-test and the Kruskal–Wallis test, with significance set at $p < 0.05$.

Results: Owned dogs comprised 90.76% males (n = 2,769) and 9.24% females (n = 282), with tick infestation (37.40%), mange (16.26%), and parvovirus infection (13.21%) as the most common conditions. Free-roaming dogs were 86.60% males (n = 168) and 13.40% females (n = 26), with mange (59.28%) and traumatic injuries (18.56%) predominating. Owned dogs had significantly higher mean prevalence of mange ($p = 0.012$) and septic wounds ($p = 0.003$) compared to free-roaming dogs. Blood smear analysis revealed hemoparasites in 25.6% of tested dogs, with the highest prevalence in the 1–3 years age group (15.3%). The Kruskal–Wallis test showed no significant differences in disease distribution among locations ($p > 0.05$).

Keywords: Dogs, Juba County; Mange; Tick infestation; Parvovirus; Haemo-parasites; South Sudan

Introduction

Dogs (*Canis familiaris*), whether owned or free-roaming, play important ecological and social roles but also serve as potential reservoirs for a wide range of zoonotic diseases. Free-roaming dog populations pose compounded risks—not only to public health but also to biodiversity—especially where they overlap with wildlife habitats in peri-urban and rural settings [1].

In Africa, recent studies have reported widespread infestations with ectoparasites such as ticks, which can transmit multiple pathogens of veterinary and public health importance, including *Borrelia burgdorferi* (Lyme disease) and *Rickettsia* spp. (spotted fever group) [2]. In Chad, serological surveys have documented canine exposure to *Ehrlichia* spp. and *Anaplasma* spp., reflecting a broad health threat despite limited surveillance data [3,4].

In South Sudan, epidemiological data on canine health are scarce, despite the presence of vector-borne zoonoses such as *Leishmania donovani*, for which dogs may serve as an important reservoir. In eastern regions, seroprevalence rates of 6.9% have been reported in dogs [5]. Similarly, studies in livestock in Bahr el Ghazal have demonstrated high prevalence (81.8%) of *Leptospira* spp., suggesting an active pathogen environment with potential for cross-species transmission [6,7].

Given this context, the present study aimed to fill the information gap by assessing the health status of owned and free-roaming dogs in Juba County, South Sudan. The investigation focused on the prevalence of external parasitic conditions such as tick infestation and mange, infectious diseases including parvovirus infection, internal parasitism, respiratory illness, and traumatic injuries, and compared disease burdens between owned and free-roaming populations across different locations.

Material and Methods

Study area

The study was conducted in Juba County, Central Equatoria State, South Sudan. The county is divided into six administrative locations: Gudele, Gurei, Gumbo, Juba center, Kator, and Munuki. These areas were selected to represent both urban and peri-urban settings where owned and free-roaming dogs are commonly found.

Study design and sampling

A cross-sectional study was carried out between September to December/2022 to assess the population structure and health status of owned and free-roaming dogs. The total sample size included 3,051 owned dogs and 194 free-roaming dogs.

Owned dogs were examined during routine visits to households and community compounds. Free-roaming dogs were observed and captured with humane restraining equipment for examination.

A subset of 39 dogs (36 males, 3 females) from both owned and free-roaming populations was randomly selected for laboratory blood smear examination to detect hemoparasites.

Data collection and clinical examination

Data collected from each dog include sex, age and health status.

Age category was estimated based on dentition and owners' information. Health status assessed through physical examination for external parasites (ticks, mange), infectious diseases (parvovirus), internal parasites, traumatic injuries, septic wounds, and respiratory disease. Rare conditions such as blastomycosis, ascites, venereal tumors, and pneumonia were also recorded.

Clinical diagnosis of mange was based on the presence of alopecia, crusting, and pruritus, confirmed where possible by skin scraping under light microscopy. Parvovirus infection was determined using rapid antigen detection kits (Speed parvo). Internal parasites were diagnosed by gross fecal examination and microscopy.

Laboratory examination

Thin blood smears were prepared from peripheral blood samples collected from the ear vein. Smears were air-dried, fixed in methanol for 5 minutes, and stained with Giemsa stain (10%, 30 minutes). Microscopic examination was performed under oil immersion (×1000) to detect and identify hemoparasites.

Data management and statistical analysis

All data were entered into Microsoft Excel 2016 and analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize frequencies and percentages. The Independent Samples t-test was applied to compare disease prevalence between owned and free-roaming dogs. The Kruskal–Wallis test was used to assess differences in disease distribution among locations. Statistical significance was set at $p < 0.05$.

Results

Owned dogs

In Juba County, a total of 3,051 owned dogs were examined (Table 1). Of these, 2,769 (90.76%) were males and 282 (9.24%) were females. Tick infestation was the most common condition, recorded in 1,141 dogs (37.40%). Mange was diagnosed in 496 dogs (16.26%), while 403 dogs (13.21%) tested positive for parvovirus infection. Internal parasites were detected in 351 dogs (11.50%).

Location	Male	Female	Ticks infestation	Mange	Parvo virus infection	Internal parasites	Septic wound	Respiratory diseases	Blastomycosis
Gudele	698	68	327	78	121	69	114	57	0
Gurei	821	64	420	146	98	71	111	39	0
Gumbo	178	26	88	53	18	10	62	0	0
Juba center	232	24	49	38	49	37	29	30	0
Kator	515	47	158	114	63	87	112	28	0
Munuki	325	53	99	67	54	77	65	13	3
Total	2769	282	1141	496	403	351	517	167	3

Table 1: Dogs population and health status of owned dogs in Juba county.

Septic wounds were found in 517 dogs (16.95%), and respiratory disease in 167 dogs (5.47%). Blastomycosis was rare, with only 3 cases (0.10%) in each of the two recorded categories.

Statistical comparison (Table 2) showed that owned dogs had a significantly higher mean prevalence of mange (82.67 ± 16.47) compared to free-roaming dogs (19.17 ± 1.72; $p = 0.012$). Likewise, septic wounds were more frequent in owned dogs (82.17 ± 14.45) than in free-roaming dogs (4.00 ± 1.15; $p = 0.003$).

A total of 194 free-roaming dogs were recorded (Table 3), comprising 168 males (86.60%) and 26 females (13.40%). Mange was the most prevalent condition, affecting 115 dogs (59.28%). Traumatic injuries were reported in 36 dogs (18.56%), and septic wounds in 24 dogs (12.37%). Other less common conditions included pneumonia (8 dogs, 4.12%), ascites (5 dogs, 2.58%), and venereal tumors (6 dogs, 3.09%).

Table 2: Relation between Mange and wounds between Owned and free roaming dogs.

Condition	Status	N	Mean	Std. Error Mean	Sign
Mange	owned	6	82.6667	16.46748	0.012
	free roaming	6	19.1667	1.72079	
Septic wound	owned	6	82.1667	14.44857	0.003
	free roaming	6	4.0000	1.15470	

Table 3: Dogs population and health status of Free roaming dogs in Juba county.

Location	Sex		Diseases and other conditions					
	Male	Female	Mange	Septic wounds	Traumatic injuries	Pneumonia	Ascites	Venereal tumor
Gudele	38	5	26	7	8	0	2	0
Gurei	25	3	18	3	5	1	0	1
Gumbo	32	4	22	2	7	0	2	3
Juba center	21	2	18	0	4	0	1	0
Kator	32	3	17	5	6	5	0	2
Munuki	20	9	14	7	6	2	0	0
∑	168	26	115	24	36	8	5	6

Thin blood smears were prepared from 39 dogs (36 males, 3 females) (Table 4). Age distribution showed that 14 dogs (35.8%) were under one year old, 19 dogs (48.7%) were between one and three years old, and 6 dogs (15.3%) were older than three years.

Blood parasites were detected in 10 dogs (overall prevalence = 25.6%). Among males, 9 dogs (23.0%) tested positive, while only 1 female (2.5%) was infected. By age group, infection was found in 3 dogs (7.6%) under one year, 6 dogs (15.3%) aged one to three years, and 1 dog (2.5%) older than three years.

Table 4: Laboratory results of thin blood smear.

Measure	Total samples collected	Sex		Age distribution		
		Male	Female	1m<year	1 year to 3 years	> 3 years
Frequency / %	39(100)	36 (92.3)	3 (7.7)	14 (35.8)	12 (48.7)	6(15.3)
Positive samples	10	9	1	3	6	1
Prevalence rate	25.60%	23.0%%	2.50%	7.60%	15.30%	2.50%

Disease distribution by location

The Kruskal–Wallis test (Table 5) showed no statistically significant differences in the distribution of mange ($p = 0.947$), septic wounds ($p = 0.801$), or respiratory disease ($p = 0.637$) across the different study locations in Juba County.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of mange is the same across categories of Location.	Independent-Samples Kruskal-Wallis Test	.947	Retain the null hypothesis.
2	The distribution of septicwound is the same across categories of Location.	Independent-Samples Kruskal-Wallis Test	.801	Retain the null hypothesis.
3	The distribution of RES.Dis is the same across categories of Location.	Independent-Samples Kruskal-Wallis Test	.637	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Table 5

Discussion

This study provides a comprehensive evaluation of the health status of owned and free-roaming dogs in Juba County, South Sudan. Among 3,051 owned dogs, males accounted for 90.76% (n = 2,769) and females 9.24% (n = 282). The most prevalent conditions were tick infestation (37.40%), mange (16.26%), parvovirus infection (13.21%), internal parasites (11.50%), septic wounds (16.95%), and respiratory diseases (5.47%). Blastomycosis was rare (0.10%). Among 194 free-roaming dogs, mange was most common (59.28%), followed by traumatic injuries (18.56%) and septic wounds (12.37%). Statistical analysis revealed higher prevalence of mange ($p = 0.012$) and septic wounds ($p = 0.003$) in owned dogs compared to free-roaming dogs. Laboratory examination of thin blood smears indicated a 25.6% prevalence of hemoparasites, predominantly in dogs aged 1–3 years.

These findings represent one of the first structured epidemiological assessments of canine health and zoonotic risk in Juba. The results underscore the high prevalence of preventable conditions, particularly ectoparasite infestations, gastrointestinal helminths, and inadequate vaccination coverage, posing significant threats to animal welfare and public health. These patterns are consistent with reports from sub-Saharan Africa, where most canine health issues are preventable through basic veterinary care and management improvements [8,9].

Ectoparasite infestations were highly prevalent, with ticks affecting over a third of owned dogs. Ticks serve as vectors for pathogens such as *Ehrlichia canis* and *Babesia* spp., emphasizing the need for community-wide control interventions including acaricide application, kennel hygiene, and public education [10,11]. Mange (*Sarcoptes scabiei*) was notably prevalent, particularly among free-roaming dogs (59.28%). Its higher incidence in owned dogs may reflect close animal contact and insufficient routine ectoparasite control [12].

Parvovirus infection, affecting 13.21% of owned dogs, indicates low vaccination coverage and underscores the need for routine immunization campaigns. Gastrointestinal helminths, notably *Ancylostoma caninum, Echinococus* and *Toxocara canis*, pose zoonotic risks including cutaneous and visceral larva migrants in humans [13]. The prevalence aligns with rural studies in Ethiopia and Nigeria, where limited veterinary access and irregular deworming sustain high parasites burdens [14,15]. Hemoparasites were detected in 25.6% of dogs, mostly young males, reflecting increased exposure to vectors through roaming and social interactions. These include *Babesia* and *Ehrlichia* spp., with both veterinary and public health implications [16].

Rabies vaccination coverage was alarmingly low. WHO recommends at least 70% coverage to interrupt transmission [17]. Barriers in Juba likely include logistical constraints, limited awareness, and shortage of trained vaccinators, as reported in other African contexts [18]. Owner knowledge of zoonotic disease was generally poor, highlighting the value of integrated health education to improve compliance with vaccination and deworming, which has been shown to reduce zoonotic disease incidence [19,20].

These findings highlight the interconnection between animal and human health. Free-roaming dogs frequently interact with wildlife and refuse sites, increasing the potential for cross-species pathogen transmission, including rabies, leptospirosis, and tick-borne rickettsial infections [21]. County-wide, coordinated interventions involving veterinary and public health authorities, supported by sustainable policies, are essential.

Septic wounds were observed in 16.95% of owned dogs, commonly associated with trauma and secondary bacterial colonization (*Staphylococcus intermedius*) [22]. Respiratory diseases (5.47%) likely reflect overcrowding and poor hygiene. Free-roaming dogs also experienced traumatic injuries (18.56%) due to environmental hazards and inter-dog aggression, consistent with other African studies [23,24].

Conclusion

In addition to wounds and traumatic injuries, Dogs in Juba Town sustained high burden of preventable parasitic, bacterial viral diseases. Extensive laboratory-based surveys using specialized diagnostic devices would uncover many of these diseases when thence a clear picture of the diseases magnitude would be revealed.

Recommendations

Extensive health education of the public about infectious and zoonotic diseases prevalent among owned and free-roaming dogs before policy intervention for control and mitigation.

Limitations

Small Sample utilized for laboratory investigation can allow generalization of the results not only for Haemo-parasites but for other diseases also.

Ethics Statement

The approval to conduct this study was obtained from the Central Equatoria State state Ministry of Animals Resources, Fisheries and Tourism.

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Conflict of Interest

The authors declare that the research was conducted in amicable environment free of any potential conflict of interest.

Generative AI Statement

Authors declare that AI generation was not used in the preparation of this manuscript.

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