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Prevalence of Gastrointestinal Parasites in Some Owned Dogs in Lokoja, Kogi State, Nigeria

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ABSTRACT

A study on the prevalence of gastrointestinal parasites in dogs in Lokoja, North central Nigeria, found significant rate of infection. Three hundred (300) faecal samples were collected from the owned dogs from Lokoja Metropolis. The dogs were grouped in exotic and local breeds. The samples collected were diagnosed under microscope for the prevalence of gastrointestinal parasites in the study location, using floatation and sedimentation techniques. The 300 samples diagnosed, showed 46.67% infected with either one or more gastrointestinal parasites. The result showed Felele 46(62.16) had the highest prevalence of gastrointestinal parasites as observed in the various study locations. In relation to season, the result showed more prevalence in the rainy season 133(42.90) as compared to dry season 110(35.48). The younger dogs 142(47.33) proved to have the highest infection rate as compared to the adult dogs 22(7.33) and this could be attributed to low immune system compared to adult dogs that have acquired impunity due to their previous exposure. The result showed statistically significant difference among all the intrinsic and extrinsic factors under consideration P<0.05). The parasites identified were *Echinococcus* spp, *Ancylostoma* spp, Coccidia, Taenia spp, Fasciola spp, and Ascaris spp. Generally gastrointestinal parasites are highly prevalent in the study area, which highlights the importance of this research that will provide a baseline to implement policies that will reduce spreading of these diseases among the dogs and other animals within the study area. There is need for mass education, on the importance of monthly deworming, and the danger associated raw meat feeding, offals feeding.

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INTRODUCTION

Canine gastrointestinal parasites pose major challenges to dog health and welfare globally (Idika *et al*., 2017). These parasites infect dogs' digestive systems and can potentially transmit zoonotic diseases (Kamani *et al*., 2021). Dogs can carry these parasites without showing any symptoms. However, if symptoms do occur, they may include loose stools, diarrhea, blood in the stool, weight loss, difficulty gaining weight, a dull and coarse coat, or visibly present worms in the feces (Soulsby 1982). Various organisms, such as roundworms (e.g., *Toxocara canis*), are prevalent intestinal parasites in dogs (Kamani *et al*., 2021). Roundworms can cause digestive disturbances, poor growth, dull coat, potbelly appearance, and even blockage of the intestines in severe cases (Soulsby 1982, and Kamani ***et al***., 2021). Hookworms, such as *Ancylostoma caninum*, attach to the intestinal lining and feed on blood. They can be acquired through ingestion, skin contact, or larvae penetration. Hookworm infestations can lead to anaemia, bloody or dark stools, weight loss, weakness, and poor overall condition. Whipworms (*Trichuris* spp) primarily infect the large intestine of dogs. Infections occur via the taking in of whipworm eggs from contaminated soil or objects. Symptoms of whipworm infestation include chronic diarrhoea, weight loss, anaemia, and inflammation. They can be transmitted to puppies through breastfeeding or ingestion of contaminated food with infective parasites. Tapeworms, such as *Dipylidium caninum* are transmitted to dogs by ingestion of infected fleas and some infected intermediate hosts, such as rodents. It is often transmitted through contaminated water sources. Infected dogs may experience diarrhoea, vomiting and weight loss. There are four main species of Echinococcus affecting man and animals; they are *Echinococcus granulosus, Echinococcus. multilocularis, Echinococcus oligarthrus and Echinococcus vogeli. Two* of *these* species are of major public health importance, namely *E. granulosus and E. multilocularis* and are responsible for virtually all the human and animal burden, causing human cystic echinococcosis (CE) and alveolar echinococcosis (AE), respectively (Jenkins *et al*., 2014). Various herbivorous and omnivorous animals serve as intermediate hosts for Echinococcus. They become infected by consuming parasite eggs found in contaminated food and water, leading to the development of larval stages within their organs. Carnivores, on the other hand, act as definitive hosts, housing the mature tapeworms in their intestines. These definitive hosts acquire the infection by eating the viscera of intermediate hosts that contain larvae. Humans are considered accidental hosts, as they can also become infected in a manner similar to other intermediate hosts, yet do not transmit the infection to definitive hosts (Acosta-Jamett *et al*., 2010; Al-Jawabreh *et al.*, 2015). There are several distinct genotypes of *E. granulosus*, some of which show specific preferences for intermediate hosts, while certain genotypes are recognized as separate species. Notably, not all genotypes infect humans. According to Bakal *et al*. (2013), the genotype causing the great majority of cystic echinococcosis in humans is principally maintained in the dog-sheep cycle and various domestic animals, including goats, pigs, cattle, camels, and yaks, can participate in this cycle. According to Kamani *et al.* (2013), unborn puppies may become infected with gastrointestinal parasites while still in the womb or later through their mother's milk (such as *Ancylostoma caninum* and *Toxocara canis*). Infections can also occur much later in life by consuming the infectious stages of protozoans or helminths which causes damage to their organs.

Intestinal parasites could also be acquired from contaminated soil, water, or other animals and pose a risk of infection to humans with whom they coexist (Ebani *et al*., 2021). Dogs harbour some of these parasites which can be zoonotic, posing risks to humans, especially children (Robertson *et al*., 2000). The types of infections they can cause include cutaneous larval migraines, hydatid disease, and tungiasis (Dakkak, 1992; Herke *et al*., 2003; Herke *et al*., 2002; Magove *et al*., 2013). Over the years in Nigeria, there has been an increase in livestock production and dog keeping for so many purposes, like hunting, guarding, and pets. Gastrointestinal parasites have been the subject of considerable research because of their cosmopolitan distribution and in terms of public health effects (Reyes *et al*., 2012).

In Nigeria, there has been a substantial increase in animal production and dog ownership for various purposes, including pets, security, hunting, exercise training in both rural and urban areas (Bethony *et al*., 2006). Despite the global and local importance of these parasites, there is a limited amount of information available regarding the prevalence of gastrointestinal parasites among owned dogs in the Lokoja metropolis. This lack of data on the prevalence and distribution of these parasites is a critical problem because it hinders the development and implementation of effective control measures, thereby potentially increasing the risk of transmission to both humans and other dogs. This existing gap in knowledge highlights the need for research to understand the local epidemiological situation, which in turn can inform public health interventions and animal health management strategies.

MATERIALS AND METHODS

Study Area

The study was carried out in Lokoja metropolis, the capital of Kogi State, Nigeria. Lokoja lies on latitude 7.796^{0}N and longitude 6.740^{0}E at an altitude of 125m above sea level. It is located at the confluence of rivers Niger and Benue. Lokoja is a tropical savanna with rainfall between May and October and a dry season between November –April, the average temperature is 28.0 ^{0}C. In Lokoja, Kogi State, average rainfall is 1,200mm annually. The driest month is January, with a cool wind from the Sahara Desert, while the hot season begins from February –April. April is the warmest with an average temperature of 32 ^{0}C and December is the coldest month with an average temperature of 25.9 ^{0}C (Adebayo, 2018; NIMET, 2020). The city was once the Capital of Nigeria where Lord Lugard once lived at Mount Patti called the majestic hill with panoramic views of the city.

Lokoja metropolis is characterized by high population density, with a household population of 931,000 (2025). The metropolis was selected for this study because a curious observation in the area revealed dog keeping for security, hunting as well as pets without proper veterinary services. The study area was divided into six sample areas based on sample statistical selection: Karaworo, Sarkin Noma, Felele, Crusher, Zango and Lokogoma. The climate in Lokoja is tropical savanna with rainfall between May and October and the dry season from November to April, the average temperature is 28°C. In Lokoja, Kogi State, the yearly average rainfall is 1,200mm. January is the driest month, characterized by cool winds from the Sahara Desert, while the hot season spans from February to April. April records the highest average temperature at 32°C, and December is the coldest month at an average of 25.9°C (Adebayo, 2018; NIMET, 2020).

All samples were collected using standard sample collection without inflicting pain or harming the animals. The research was conducted after the approval of the Research and Ethics committee of Federal University Lokoja, Nigeria.

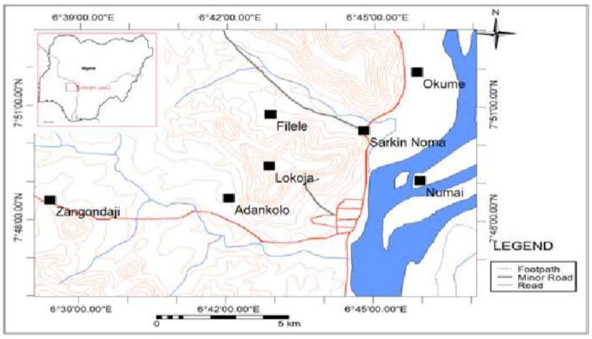

Figure 1: Map of Lokoja. Source: Omonona, *et al*., 2015

Determination of Sample Size

Due to the unavailability of data on the prevalence of gastrointestinal parasites in Lokoja Kogi State, Nigeria. The prevalence of 20% was used to determine the sample size which is calculated using the formula, as cited by Iboyi (2010) as follows:

$n = Z^2 \times P(1-P)/E^2$

Where n is equal to the sample size.; Z =standard normal distribution at 95% confident interval=1.96; P = prevalence rate at 20%; q=1-p = 1-0.2; L = allowance = 5% or 0.5

Substituting values in the above formula,

Given: n equals? Z = 1.96, P= 0.1, q= 1-0.2=0.8, L= 0.05

Therefore

N = (1.96)2x0.8

(0.05)2

=3.8416x0.16

0.0025

=245.86

~ =300

A total of 300 stool samples were collected from Owned dogs in Karaworo, Felele, Zango, Sarkin Noma, Crusher, and Lokongoma.

Collection of Faecal Samples

A total of 300 faecal samples were collected in this study. With the aid of safety hand gloves and the use of a scooping spoon 10g of stool/dog was scooped into the sample bottle and covered with the lid. The dog sample were picked randomly within the study area. The stool samples were preserved in 10% formaldehyde in the bottles and later subjected to laboratory analysis by sedimentation method and serially labelled at each of the six locations. A data form provided with information on the age, sex, breed purpose keeping and educational status of the owner. Sample containers were labelled serially for all the study sites, safety measures were observed to avoid contamination from urine, water and disinfectants. The stool samples were transferred to the Biology Laboratory of Federal University Lokoja, for analysis.

Preparation and Examination of Faecal Samples

Half a teaspoonful (3g) of the stool sample was mixed thoroughly with water and filtered through a funnel lined with two layers of gauze. Each filtrate was centrifuged at 2000 rpm for three minutes; the supernatant was discarded, and the sediment was re-suspended in 10 ml of physiological saline before being centrifuged again, discarding the supernatant. The sediment was subsequently re-suspended in 7 ml of formalin saline and allowed to stand for 10–15 minutes for fixation, after which 3 ml of ether was added. The tube was shaken vigorously, then the stopper was removed and centrifuged at 2000 rpm for 2 minutes, allowing the tube to rest. Four distinct layers were then visible: the top layer contained ether, the second was a debris plug, the third layer was comprised of clear formalin saline, while the bottom layer contained the sediment. The debris was carefully detached from the tube's sides using a glass rod, and the liquid was decanted, leaving a small amount of formalin saline to suspend the sediment. The gastrointestinal parasites were observed under a microscope with a 10X–40X objective lens, and morphological identification of parasite eggs was carried out according to standard parasitology references (Ochie & Kolhakar, 2021).

Statistical Analysis

The prevalence was calculated for all data as the number of infected dogs were divided by the number of examined dogs, and was expressed in percentage by multiplying by 100.The data obtained in this study were entered into Microsoft Excel 2011 and analyzed using the SPSS version 17. Bivariate analysis was performed using Chi-square test to check for association between variables (Edia-Asuke *et al*., 2015).

RESULTS AND DISCUSSION

A total number of 300 stool samples collected from dogs across six study locations; different infection rates were observed. A total of 140 samples (46.67%) tested positive for various types of gastrointestinal parasites, with Felele having the highest prevalence 62.16% (n=46). The prevalence of Gastrointestinal parasites among owned in Crusher was 52.11% (n= 37) while those of Sarkin-Noma and Lokongoma were 44.00% (n=22) and 26.00 (n=14) respectively. Statistically significant variations were noted among the locations examined ($p < 0.05\%$) (Table 4.1).

Table 4.2 demonstrates the infection rate of gastrointestinal parasites in dogs in relation to the two seasons. The study has revealed a higher infection rate in the rainy season with 42.90% (n=133) as compared to the dry season with 35.48% (n=110). There was a statistically significant difference ($P<0.05$) between the two seasons as observed in this study. The result also showed eight (8) out of the nine (9) species of parasites encountered were more found in the rainy season with the exception of *Fasciola hepatica* which has less infection of 1.30 % (n=4) during the rainy season as compared to that of the dry season with infection of 4.19 % (n=13). *Echinococcus granulosus* proved to be the most prevalent (8.26%, n=26) in the rainy season, followed by *Taenia* (7.42%, n= 23) (Table 4.2).

Out of 300 owned dogs sampled in this study, the 140 dogs infected with gastrointestinal parasites, 69 (23.00%) had single infections, 57 (19.00%) had double infections, and 14 (4.67%) had triple infections (Table 4.3).

In terms of sex distribution among the 300 sampled dogs, 135 were male and 165 females. The findings revealed that 69 (23.00%) of the males and 71 (23.67%) of the females were infected with at least one type of gastrointestinal parasite, with no statistically significant difference noted ($P>0.05$) among male and female infection rates. The result also showed that owned dogs in the study area were positive for gastrointestinal parasites from four (4) phyla (Nematoda, Cestoda, Trematoda and Protozoan). Nematodes had a higher number of each. (Table 4.4).

Table 1: Prevalence and Distribution of Gastrointestinal Parasites in Some Owned Dogs in Lokoja, Nigeria

Sampling Locations	No. Examined	No.and % Positive
Karaworo	20	8(40.00)
Felele	74	46(62.16)
Zango	34	13(38.25)
Sarkin Noma	50	22(44.00)
Crusher	71	37(52.11)
Lokongoma	51	14(26.00)
Total	300	140(46.67)
F.cal		1.976
P.value		0.087*
F.crit		2.542

* = Statistically Significant

Table 2: Distribution of Different Gastrointestinal Parasites Among Some Owned Dogs in Lokoja by Season

Parasite species	Dry season	Rainy season	F.cal	P. value	F. criteria
T. saginata	19(6.13)	23(7.42)	3.412	*0.02	1.75
A. lumbricoides	9(2.90)	16(5.16)			
T. trichiria	17(5.48)	21(6.77)			
F. hepatica	13(4.19)	4(1.30)			
E. granulosus	15(4.83)	26(8.38)			
Ancylostoma caninum	5(1.61)	7(2.26)			

Parasite species	Dry season	Rainy season	F.cal	P. value	F. criteria
Trichostrongyloide	9(2.90)	10(3.22)			
Capillaria	6(1.93)	8(2.58)			
Isospora canis	14(4.51)	18(5.80)			
Total	110(35.48)	133(42.90)			

Table 3: Prevalence of Gastrointestinal Parasites in Single and Mixed Infection in Some Owned Dogs in Lokoja (n=300)

Type of Infection	Parasites detected	No. of dogs infected
Single infection	*Taenia*	13
	Echinococcus	7
	A. caninium	5
	Ascaris	3
	Fasciola	7
	Capillaria	7
	Trichuiris	17
	Isospora	10
Sbtotal		69(23.00%)
Double infection	*Ascaris/Isospora*	5
	Tania/ Ascaris	4
	Trichuiris/ Ancylostoma	2
	Fasciola/Ascaris	2
	Trichuiris/Ascaris	4
	Trychostrongloid/ trichuris	7
	Echinococcus/ capillaria	5
	Fasciola/Isospora	4
	Tania/Echinococcus	24
Sub total		57(19.00%)
Triple infection	*Tania/fasciola/ Trichostrongloid*	14
Subtotal		14(4.67%)
Total		140(46.67%)

Table 4: Distribution and Types of Gastrointestinal Parasites in Owned Dogs by Sex

Sexes	No. of dogs examined	No. positive	Cestodes (Name of parasites)	Nematodes (Name of parasites)	Trematode	Protozoan
Male	135	69(23.00)	*Taenia* *Echinococcus*	*Ancylostoma* *Ascaris* *Trichuiris* *Capillaria*	*Fasciola*	*Isospora*
Female	165	71(23.67)	*Taenia* *Echinococcus*	*Ancylostoma* *Ascaris* *Trichuiris* *Capillaria*	*Fasciola*	*Isospora*

Distribution of Gastrointestinal Parasites in Owned Dogs in Lokoja by Intrinsic Factors

A total of 90 samples screened in the current study, were those dogs below 12 months of age and had a higher prevalence of gastrointestinal parasites as compared to those that are 12 months and above. The difference in the level of parasitic infection was statistically significant (P<0.05) between the two categories.

In reference to the breed, 250 dogs were local, while only 50 were exotic. Out of the 250 local breeds, 120(40.00) were found positive for gastrointestinal parasites while only 20(6.67) of the exotics had the infection. Another factor which was considered was the range management. Out of the 200 free-ranged dogs, 112(37.33) were positive for intestinal parasites while only 28(9.33) of the dogs under intensive care were found positive. The result was not statistically significant (P>0.05) (Table 4.5).

Distribution of Gastrointestinal Parasite in Owned Dogs in Lokoja by Extrinsic Factors

The six extrinsic factors considered in this study showed an association with gastrointestinal parasites in infected dogs in Lokoja. The major factor that showed the highest gastrointestinal parasites was lack of deworming 134(43.22%) as compared to dewormed dogs 6(1.93%). The result showed a statistical significance difference (P < 0.05) among dewormed and un-dewormed dogs.

The gastrointestinal parasites-infected dogs showed statistical variation (P < 0.05) in relation to the education levels of their owner. Dogs owned by primary school leavers proved to have a higher (22.58%) rate of gastrointestinal parasitic infection than other groups under consideration.

Out of 140(45.16%) dogs found to be positive with gastrointestinal parasites, dogs used for breeding and pet purposes had less gastrointestinal parasite infection 6(1.93%) while those use for hunting had higher percentage of infection 117(37.74%) (Table 6).

Table 5: Distribution of Gastrointestinal Parasites in Owned Dogs in Lokoja by Intrinsic Factors

Age (months)	**< 12**	**90**	**72 (24.00)**	**22(7.33)**	**0.94***
	>12	**210**	**68 (22.67)**	**142(47.33)**	
Intrinsic Factors	Characteristics	Number Examined\	No. positive (%)	No. negative (%)	P. value
Breed	Local	250	120 (40.00)	130(43.33)	0.91 N.S
	Exotic	50	20 (6.67)	30(10.00)	
Management system	Free range	200	112(37.33)	88 (29.33)	
	Intensive	100	28(9.33)	72(28.00)	0.06*

N.S = Statistically Not Significant, * = Statistically Significant and % = Percent

Table 6: Distribution of Gastrointestinal Parasites in Owned Dogs in Lokoja by Extrinsic Factors

Variables	Characteristis	Owner of positive (+) dogs (%)	Owners of negative (-) Dogs (%)	Odds ratio or (95%Cl)	P. value
Educational Level	Primary	70(22.58)	60(19.35)	0.23(0.04, 2.24)	0.07*
	Secondary	55(17.74)	62(20.00)		
	Tertiary	15(4.84)	48(15.48)		
Allow roaming	Yes	126 (40.65)	136(43.87)	1.35(0.22, 5.05	0.08*
	No	14(04,51)	34(10.97)		
Purpose of Keeping	Security	10(3.22)	61(19.68)		
	Pet	7(2.26)	31(10.00)		
	Hunting	117(37.74	49(15.80)	0.28(0.01,0.98)	0.07*
	Breading	6(1.93)	29(9.35)		
Feeding with fresh meat	Yes	125(40.34	112(36.13)	3.01(0.05,2.90	0.77*
	No	15(4.83)	58(18.71)		
Feeding with offal	Yes	81(26.13)	60(19.35)	0.23(0.01,1.33	0.37
	No	69(22.26)	90(29.03)		
Deworming	Yes	6(1.93)	70(22.58)	0.88(3.22. 0.01)	0.072*
	No	134(43.22	100 (32.26)		

Discussion

The present study aimed to investigate the prevalence of gastrointestinal parasites of owned dogs in Lokoja, Kogi State Nigeria. For this reason, 300 faecal samples were collected from free ranged dogs and dogs confined within houses in Lokoja metropolis. Microscopic examination was carried to detect the presence of various species associated with dogs and the prevalence of each species encountered. Studying the incidence of gastrointestinal parasites is important for preventing the transmission of these diseases to both human and other animals. It also assists in developing policies that reduce zoonotic diseases. This type of research work has importance in public health implications, for the reason that many of these parasites are zoonotic as reported by Ngwamah *et al* (2025), therefore understanding their prevalence and the risk factors associated with them can inform the straitegies for the parasites and prevention in this specific region. There have been few reports on the incidence of gastrointestinal parasites of dogs in a few states in Nigeria (Ayinmode *et al*., 2021) and Africa (Sulieman *et al.,* 2020). However, there is little or no report on the incidence of gastrointestinal parasites of dogs in Lokoja Kogi State, Nigeria.

The overall prevalence in the current study was 46.67% of the three hundred dogs examined, involving different types of parasites regardless of the collection site location, sex of the dogs and breed. These findings align with previous research report on the prevalence of gastrointestinal parasites in owned dogs (Ezema *et al*., 2019; Showemimo, 2008;), emphasizing the need for increased efforts to address parasitic infections in this population. The overall prevalence of gastrointestinal parasite infections was substantially higher in this study area compared to findings by Alishani *et al*. (2017) and Awosanya *et al.* (2021), both of which reported significantly lower rates in their studies conducted in Lagos, Nigeria, and Kosovo, Eastern Europe, respectively. In contrast to this finding is the report of Kamani *et al*., 2020, that revealed exceedingly higher incidence of gastrointestinal parasite (75.83%) in his research conducted in Suleja Metropolis. Higher occurrence of *gastrointestinal Parasites 46.67%* in the study area was far higher to what was reported in Jos and Kosovo earlier before now (Alishani *et al., 2017).*

The high prevalence rate of 46.67% in the study area is sconsistent with global trends, as dogs are known to be primary hosts for various major gastrointestinal parasites (Amapu *et al*., 2019; Pam *et al*., 2015), including *Echinococcus granulosus, Taenia* spp, and *Isospora* spp. Therefore, the high prevalence (46.67%) of gastrointestinal parasites among owned dogs in the study area is a global issue, as it is in agreement with the report of some researchers, Amapu *et al.,* 2019 (71.33%) in Jos, Minaar, *et al., (*2002) South Africa and Zelaman *et al.,* 2012, Ethiopia.

Prevalence of Parasite Species

The most commonly identified gastrointestinal parasites in the evaluated dog samples were, *Isospora, Taenia Fasciola, and Trichuris* species, likely due to their favourable adaptability to the environmental conditions of the study area as also reported by some researchers including Amapu *et al*., 2019; Ogbu *et al*., 2018 and Pam *et al*., 2015 and Zelamen *et al*., 2012). The dogs may come in contact with these parasites due to poor hygiene practices, such as inadequate and disinfection of their living area and lack of good toiletry system and poor waste management. It could be due to the fact that the eggs and larvae of these parasites have contaminated the environment of the study area due to the inadequate mass education on the risk associated with these parasites and the possible of get rid of them. Consumption of undercooked and raw meat around the abattoir could be another reason. Predominantly *Coccidia, Ancylostoma cranium, Ascaris lumbricoid, Toxocara canis, and Isopora canis* have been reported as the most commonly associated parasites within and outside Nigeria (Amapu *et al.,* 2019, Ogbu *et al*., 2018, Pam *et al.,2015,* Zelamen *et al*., 2012*).*

Mixed Infection Rate

Some of the positive dogs had mixed infections, comprised of *Ascaris; Ancylostoma; Isospora; Trichuris; Diphylidium caninium, Taenia species and Fasciola species.* Dogs with mixed infections could be due to environmental exposure, geographical location bringing about more exposure of dogs to specific parasites due to environmental factors in the regions or climate. Age might influence mixed infection because puppies are more susceptible to parasitic infections due to their developing immune systems and potentially exposed to parasites from their mother. Mixed infection rate might be due to the health status and even compromised immune systems such as underlying health conditions. Interaction with infected animals including stray dogs, can increase the risk of parasite transmission. Another reason for positive dogs is lack of regular deworming treatments leading to persistent parasite infections. This is in line with the reports of Magove *et al.* (2013); Bitrus, (2021); Katagiri and Oliveira-Sequeira, (2008); Sowemimo and Asaolu(2008); and Swai, (2010) who recorded mixed infection in their prevalence infection studies. The parasites isolated from this work had been isolated elsewhere in Nigeria, and the variances lie in the prevalence, exposure, and population density between the study locations (Ayinmode *et al.,* 2021 and Suleman *et al.,* 2020).

Sexes Specific Prevalence

The data indicated a trend based on sex, with females showing a higher prevalence (23.67%) compared to males (23.00%). Though this difference was not statistically significant (P>0.05), the higher prevalence in females may be linked to females having different behaviors or habits that increase their exposure to parasites, such as more frequent contact with contaminated environments or animals. Dietary habit of Feeding on raw or undercooked meat, especially from infected animals, may increases the risk of parasite transmission. Environmental factors such as the likelihood to come into contact with contaminated environments while searching for food, especially to feed their puppies. Throughout a female's life hormonal fluctuation might influence immune responses and susceptibility to parasites. Females may be more likely to engage in activities that increase their exposure to parasites, such as exploring contaminated environments. Gender prevalence could also be attributed to compromised immune system during pregnancy, as suggested by previous studies (Mathias *et al*., 2023; Sowemimo and Asaolu, 2008 and Swai *et al.,* 2010). This contradicts the findings of Awosanya *et al.* (2021), who reported a significant prevalence difference favoring females with gastrointestinal parasites, which could be attributed to their compromised immune system during the pregnancy.

Age Specific Prevalence

The age distribution revealed that puppies under 12 months exhibited a higher prevalence of gastrointestinal parasites (24.00%) compared to adults (22.67%). This prevalence in puppies may be attributed to the fact that younger puppies are being fond of scavenging in unhealthy locations. Puppies are playful (at their active age), natural curiosity and explorative a behavior that exposes them to contaminated environments, food and water. Younger puppies' Immature gut that still developing, making them more vulnerable to parasite colonization. Lack of deworming making them more susceptible to parasite infection. Maternal transmission by acquiring parasites from their mother during pregnancy or nursing might increase the prevalence too. It also could be due to their juvenile immune system. The immune system of the younger ones differs from that of the adult, potentially increasing their exposure to the parasites as compared to the older dogs. The older dogs may have better hygiene and grooming habits reducing their exposure to parasites and helping them to build up adequate immunity that reduce the level of exposure to parasites and helping them to build up adequate immunity that reduce the level of parasite egg in their faeces (Swai *et al.,* 2010).

Breed Specific Prevalence

Generally, the prevalence of gastrointestinal parasites in indigenous breeds is higher (40.00%) than in exotic breeds (6.67%). The most important helminth parasite eggs of zoonotic significance isolated from this work were *Echinococcus granulosus*, *Ancylostoma, Ascaris* and *Trichuris trichuria.* Local breeds have been found to have higher prevalence rates of gastrointestinal parasites than exotic breed. This might be because they are often used for search and rescue, police work, or military operations, may be more likely to be exposed to parasites due to their high activity levels and environmental exposure. Breeds like the local breeds which are used for hunting, may likely come into contact with infected animals and contaminated environments.

Many studies have supported that the free-range system had a significant influence on the prevalence of gastrointestinal parasitic infection as reported by Scaramozzino *et al., (*2009) Chelsea and Williams, (2023) reported that free-range dogs are unlikely to come in contact with the infective stage of gastrointestinal parasites. However, the habit of keeping free-range dogs, feeding them with offals, and fresh meat had been the main factor responsible for the high infection of gastrointestinal parasites in the free-range owned dogs.

Other Extrinsic Factors

Other extrinsic factors such as deworming, feeding them with fresh meat in this study showed a high infection rate in the un-dewormed dogs where 43.22% were found infected with one or more intestinal parasites. The 134(43.22%) out of 300 dogs evaluated were all found in the undewormed dogs. The 9.03% infection record in intensive dogs may be attributed to more faecal samples of free-range dogs that were collected during the study as also reported earlier by Bitrus *et al.,* (2021). The 1.93% observed in the dewormed dogs may also be attributed to the high effectiveness of the drug in use in the study location as recommended by the World Health Organization (WHO) that periodic deworming of dogs showed high effectiveness in China (Zhou *et al.*,2020).

Extrinsic factors such as dog owners' characteristics, dog roaming, feeding of undercooked meat, consumption of contaminated offal's, and dog deworming frequently were significantly associated with intestinal parasite infection in dogs in this study, this is also similar to the findings of Liu *et al., (2012*) among owned dogs in China. The impact of some of the extrinsic factors could have been influenced by the deworming status of the dogs.

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