

Full Length Research Paper

Occurrence of endo and ecto parasites of dogs in Dawaki and Bukuru Dog Markets in Plateau State, Nigeria

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The study was aimed at determining the prevalence of endo and ectoparasite of dogs in Dawaki and Bukuru dog markets of Plateau State. A total of 150 dogs were sampled for haemoparasite, gastrointestinal parasite and ectoparasites. Standard floatation technique and Giemsa stained thin blood smear methods were used for gastrointestinal and haemoparasites, respectively while ectoparasites were identified using standard taxonomic keys. A total 10.67% (16/150) were positive for haemoparasite, 30.67% (46/150) for gastrointestinal parasite and 16.00% (24/150) for ectoparasites. Gastrointestinal parasites detected included *Ancylostoma* species as 20.67% (31/150), *Diphylobothrium latum* as 12.67% (19/150), *Isospora* species as 5.33% (8/150), *Taenia* species and *Necator americanus* recorded the same frequency 0.67% (1/150); only single haemoparasite detected during the present study was *Babesia canis* 10.67% (16/150) while ectoparasites detected includes *Rhipicephalus* species as 15.33% (23/150) and *Amblyomma* species as 2.67% (4/150). No significant difference ($p < 0.05$) was seen in the association based on age, sex and location. It was concluded that ectoparasites, haemoparasites and gastrointestinal parasites some of which may pose threat to public health are prevalent in the study area and affect the dogs irrespective of their age, breed or location. Strategic treatment of dog and responsible ownership with proper housing management were recommended.

Key words: Endoparasites, ectoparasites, dogs, dog markets Plateau State.

INTRODUCTION

Parasites are eukaryotic, unicellular or multicellular, heterospecific organisms that derive nourishment by feeding on or within another organism (Adejoke, 2005).

Parasitism is an association whereby parasite is always

benefiting while the other partner called the host of the parasitic association always suffers some degree of injuries which are capable of causing disease (Ogo et al., 2005). Generally, parasites can be divided into two

groups: endoparasites and ectoparasites. Endoparasites are parasites that live inside their host (Sasaki et al., 2007). Ectoparasites are parasites that live outside their host; they feed with at least part of their body outside the host epithelium (Sasaki et al., 2007). Endo and ectoparasites can cause poor performance in animals and can lead to economic losses for the owner. Animal keepers must therefore understand the type of parasitism they encounter and the method of controlling them to minimize losses (Bryson et al., 2000).

Endoparasites such as gastrointestinal parasites are common problem of dogs. Dogs become infected with the parasite either as they are born or later with their mother's milk. The microscopic examination of a stool sample will usually help to determine the presence of intestinal parasites. The gastrointestinal helminthosis is the most commonly encountered disease in dogs and it also acts as a major constraint in dog keeping across the globe (Traub et al., 2007; Saini et al., 2012). Gastrointestinal helminthosis in dogs may be asymptomatic or cause gastrointestinal disorders, lack of appetite, loss of weight, retarded growth and in severe cases death (Panigrahi et al., 2014). The distribution and intensity of the disease are mainly influenced by geographical, climatic, cultural and economic factors (Robertson et al., 2000). The level of hygienic conditions, lack of veterinary supervision and public awareness campaign concerning zoonotic diseases increase the transmission of the disease (Panigrahi et al., 2014).

Dogs may be infected with pathogenic haemoparasites including *Babesia* species (Nalubamba et al., 2011; Eljadar et al., 2012; Gonde et al., 2014); *Trypanosome* species (Keck et al., 2009); *Leishmania*, *Hepatozoan*, *Ehrlichia*, *Anaplasma*, and *Dirofilaria* species which are transmitted through different arthropod vectors including ticks, lice, triatomines, mosquitoes, tabanids and phlebotomine sand flies (Kaur et al., 2012). They cause an illness called Canine Vector-Borne Disease (CVBD) in tropical and subtropical countries, some of which are of zoonotic importance (Saritas et al., 2005; Chhabra et al., 2013).

There is a paucity of information on the prevalence of endo and ectoparasites of dogs in the study area hence screening of dogs to detect parasitic infection is recommended to enable owners to institute treatment and to safeguard public health becomes imperative.

MATERIALS AND METHODS

Study area

The study was carried out in Dawaki and Bukuru dog markets of Kanke and Jos South Local Government areas of Plateau State.

Jos Plateau is a slightly undulating highland and rises from steep escarpments from the riverine plains of River Benue and descends towards Bauchi State Nigeria. The state is located in the north central part of the country. It lies between latitude 7° 11' N and 7° 25' E (Plateau State Diary, 2004). Kanke Local Government covers an area of 926 km², the local government is bounded to the north by Bauchi State, to the South by Langtang North Local Government, to the east by Kanam Local Government and to the west by Pankshin Local Government areas. Jos South Local Government Area is one of the nearest Local Governments to the state capital and is about 13 km south of the state capital (SCRD, 2011).

Sampling technique

A cross-sectional study was conducted to determine the prevalence of Ecto and Endo parasite (Hemo and Gastrointestinal) of dogs in the study areas with no bias toward sex and age and location of the dogs. The number of samples collected was determined using the expression as described by Thrusfield, (2007) $N = Z^2 PQ/d^2$; where N= no. of samples to collect, Z = A constant degree of freedom, P = percentage of published prevalence, Q = (1-P), d = Confidence interval designed as 0.05.

Sample collection

A total of 300 fecal and blood samples (150 each) were collected from the rectum and cephalic vein of the dogs, respectively in the study area. Information on sex and age were obtained after the consent of the owners were sought to ensure co-corporation. Blood samples were collected into sample bottles containing ethylene diamine tetra-acetic acid (EDTA; 2 mg/ml of blood). Fecal samples were collected directly from the rectum of dogs using disposable gloves. Ecto parasites recovered from the bodies of the dogs were placed in 70% alcohol for preservation before identification. All samples were thoroughly preserved before being transported to the Parasitology Laboratory Division of National Veterinary Research Institute Vom Plateau State for analysis.

Blood sample analysis

The blood samples were analyzed using Giemsa thin smear techniques adopted by Ochei and Kolhatkar (2007). The slides were examined under oil immersion (X100) objective. Observations were recorded.

The capillary tubes were placed in the haematocrit centrifuge and spine at 3000 rpm (predetermined speed) for 5 min. Haematocrit Centrifugation Technique (HCT) was used to examine the buffy coat for motile blood parasites.

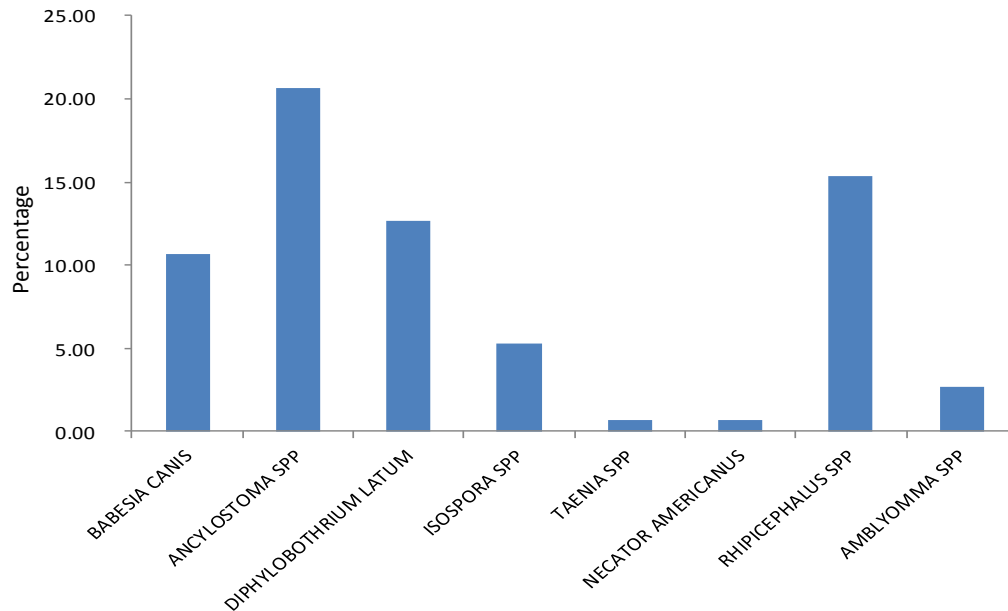
Fecal samples analysis

Fecal sample were subjected to sodium chloride flotation techniques for identification of the larva and the egg stages of the parasites. Fecal samples were analyzed as described by Soulsby (1982) viewed using magnifications. The observations were

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Table 1. The overall prevalence of endo and ectoparasites of dogs.

Parasite	Number positive	Prevalence (%)
Haemoparasite	16	10.67
Gastrointestinal parasite	46	30.67
Ectoparasite	2	16.00
Total	86	57.33

**Figure 1.** Specific prevalence of ecto and endoparasites species identified.

recorded after viewing the slides under objective (X10) and confirmation was made with (X40) (Gupta and Singla, 2012).

Ectoparasites identification

All ectoparasites obtained from the dogs were preserved in 70% alcohol and identified based on an entomologist morphological feature using keys and atlases described by Soulsby (1982).

Data analysis

Data obtained from laboratory analysis were subjected to test using Chi square test of independence and values of $p < 0.05$ were considered statistically significant. Results were presented in tables and expressed in simple percentages.

RESULTS

Overall prevalence of endo and ectoparasite of dogs

A total of 150 dogs were sampled in Dawaki and Bukuru dog markets for haemo, gastrointestinal and

ectoparasites. These comprise dogs of different age, sex, and location. Out of the total dogs sampled 10.67% (16/150) were positive for haemoparasites, while gastrointestinal parasites prevalence was 30.67% (46/150) and ectoparasite 16.00% (24/150) overall prevalence (Table 1).

Specific prevalence of endo and ectoparasite identified

Of the 150 dogs examined in both locations, five gastrointestinal parasites were identified namely: *Ancylostoma* species had the highest prevalence of 20.67% (31/150) while *Taenia* species and *Necator americanus* had the least prevalence 0.67% (1/150), respectively. For haemoparasite, *Babesia canis* was the only parasite identified with 10.67% (16/150) while ectoparasite had two species identified which are *Rhipicephalus* species with 15.33% (23/150) and *Amblyomma* species with 2.67% (4/150) prevalence (Figure 1).

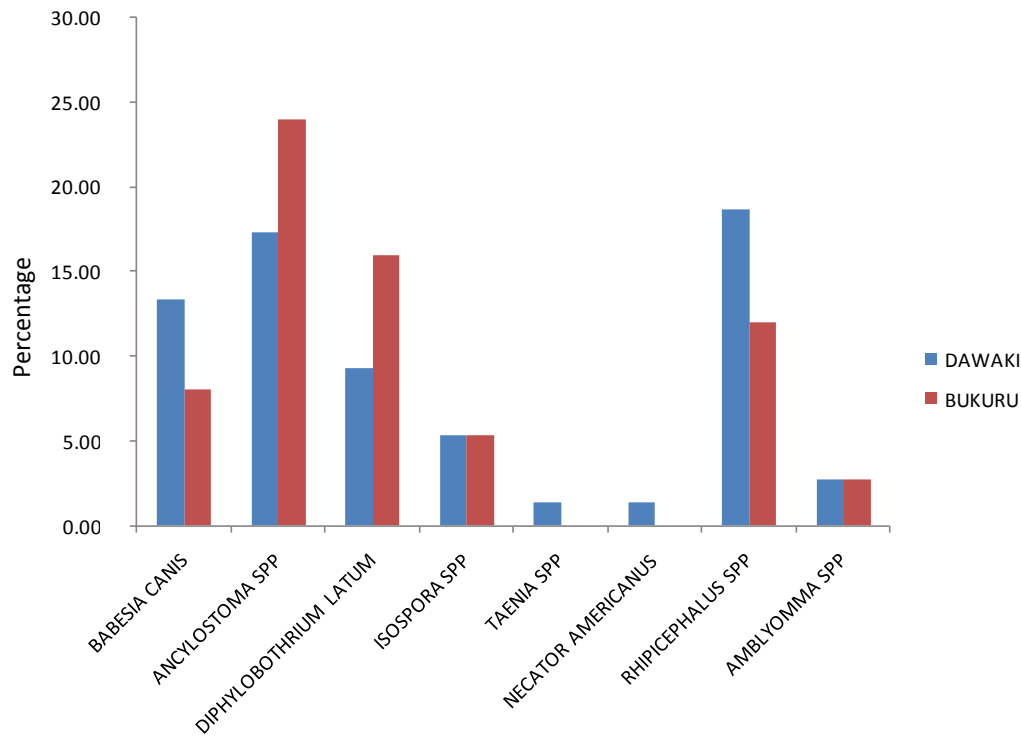


Figure 2. Prevalence of endo and ectoparasite base on location.

Prevalence of endo and ectoparasites based on location

A total of 150 dogs were sampled, 75 from each location, respectively. In Dawaki dog market, *Babesia canis* was the only haemoparasite identified with 13.33% (10/75) prevalence. Five species of gastrointestinal parasite were identified which were: *Ancylostoma* spp., *Diphylobothrium latum*, *Isospora* species, *Taenia* spp. and *N. americanus*. *Ancylostoma* spp. was 17.33% (13/75) while *Taenia* and *N. americanus* were least prevalent of 1.33% (1/75). The ectoparasites identified are *Rhipicephalus* spp. and *Amblyomma* spp. with 18.67% (14/75) and 2.67% (2/75) prevalence.

In Bukuru dog market, *B. canis* was also the only haemoparasite identified with 8.00% (6/75) prevalence, while three species gastrointestinal parasites identified which were *Ancylostoma* spp., *D. latum*, and *Isospora* spp. *Ancylostoma* had the highest prevalence with 24.00% (18/75), while *Isospora* spp. had the least prevalence 5.33% (4/75). Ectoparasites identified are *Rhipicephalus* and *Amblyomma* spp. with prevalence of 12.00% (9/75) and 2.67% (2/75). The influence of location was not significant at $p < 0.05$ (Figure 2).

Prevalence of endo and ectoparasite of dogs base on sex

A total of 81 dogs were male and 69 were female. For

haemoparasite, *B. canis* was the only parasite recorded with males having the higher prevalence of 13.58% (11/81) compared to female which had 7.25% (5/69) prevalence.

Three species of gastrointestinal parasite were recorded for male which are *Ancylostoma* spp., *D. latum*, and *Isospora* spp. *Ancylostoma* spp. had the highest prevalence of 23.46% (19/81) while *Isospora* spp. had the least 8.64% (7/81) prevalence. The female had five species of gastrointestinal parasites which include *Ancylostoma* spp., *D. latum*, *Isospora* spp., *Taenia* spp. and *N. americanus* with *Ancylostoma* spp., having the highest prevalence of 17.39% (12/69) while *Taenia* spp. and *N. americanus* had the least prevalence of 1.44% (1/69), respectively. However, ectoparasite also recorded slight high prevalence in female than in male with *Rhipicephalus* spp. having 15.94% (11/69) and male 14.81% (12/81) and *Amblyomma* spp. 4.94% (4/81). The influence of sex was not significant at $p < 0.05$ (Figure 3).

Prevalence of endo and ectoparasite based on age

Based on age, the dogs were divided in two groups young (0-1 year) and adult (2 years above). A total of 107 dogs were adult and 43 were young. Among the adult *Babesia canis* was the only haemoparasite identified with 12.15% (13/107) while the young has 6.97% (3/43) prevalence. Five gastrointestinal parasites were identified among the adult and three among the young. Among the

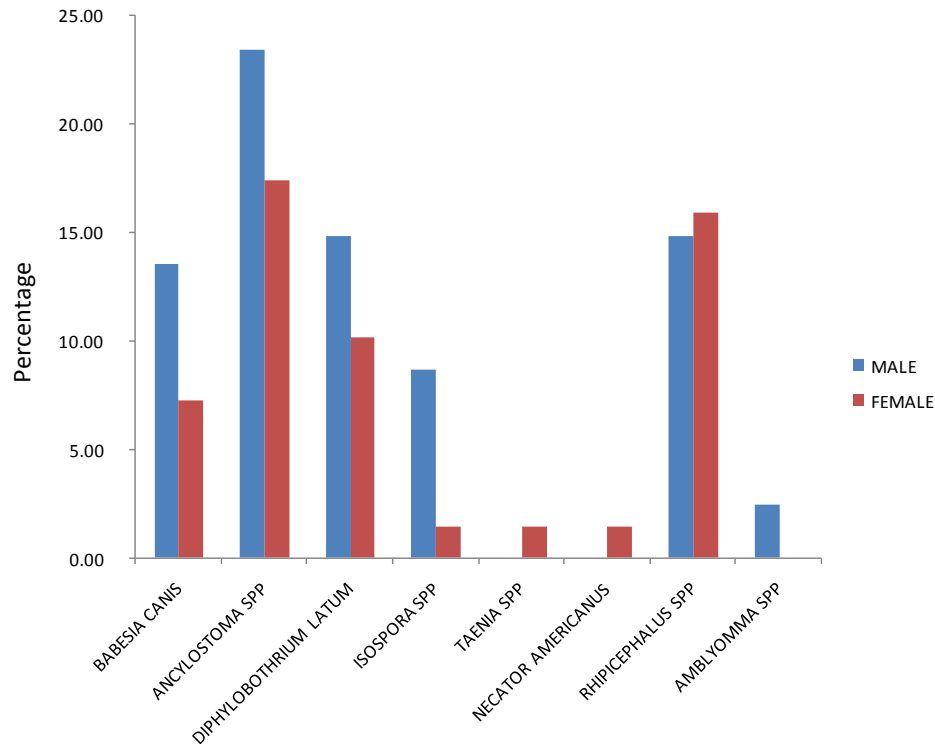


Figure 3. Prevalence of endo and ectoparasite based on sex.

adult, *Ancylostoma* spp. had the highest prevalence with 19.62% (21/107), while *Taenia* spp. and *N. americanus* had the least 0.93% (1/107). For the young, *Ancylostoma* spp. also recorded the highest prevalence of 23.25% (10/43), while *Isospora* spp. had the least 4.65% (2/43). Two species of ectoparasite were identified which are *Rhipicephalus* and *Amblyomma* spp. Among the young *Rhipicephalus* spp. was the most abundant with 20.93% (9/43) and *Amblyomma* spp. With 6.97% (3/43) while the adult had a lower prevalence of 13.08% (14/107) and 0.93% (1/107) for *Rhipicephalus* and *Amblyomma* spp. There was no significant difference ($p < 0.05$) (Figure 4).

DISCUSSION

There are several reports on the prevalence of parasitism in dogs from different parts of Nigeria (Kamani et al., 2011; Adejoke, 2005). In the current studies, 16.00% of the sampled dogs were positive for ectoparasite which included *Rhipicephalus* and *Amblyomma* spp. with the prevalence of 15.33 and 2.67%, respectively. *Rhipicephalus* spp. was the most abundant species found in the study which agrees with the reports by Agbolade et al. (2008) and Ekanem et al. (2010) who reported the same species with the highest prevalence of *Rhipicephalus* spp. in Calabar. Other related studies in parts of Nigeria (Arong et al., 2011) also reported similar observations in ticks prevalent in Nigeria. *Rhipicephalus*

ticks are more commonly found in dogs from Africa and other countries of the world (Gonzalez et al., 2004). While *Amblyomma* ticks are less common in dogs and would be transmitted from ruminants (Bhatia et al., 2007) mainly shepherd dogs. *Rhipicephalus* ticks have been described to parasitized humans (Dantas-toress et al., 2006) and may transmit rickettsia disease and visceral leishmaniasis (Coutinho et al., 2005). *Rhipicephalus sanguineus* and *Boophilus* species have been shown to transmit *B. canis* and *Ehrlichia canis* in dogs (Bhatia et al., 2007; Kottadamane et al., 2016).

Gastrointestinal parasites were found in 46 sampled dogs out of the 150 which gives an overall prevalence of 30.67% (46/150). Five species were recorded which are *Ancylostoma* spp., *D. latum*, *Isospora* spp., *Taenia* spp. and *N. americanus*. *Ancylostoma* spp. in this study had the highest prevalence of 20.67% which is lower compared to the 54.8% reported by Mustaph et al. (2011) in Maiduguri and agreed with Ugbomoiko et al. (2008) who reported 16.9% prevalence in Nigeria. This work is also in contrast with the work of Gingrich et al. (2010), Swai et al. (2010) and Degefu et al. (2011) that reported prevalence around 57 to 58% for this parasite in Ethiopia and Galapagos Islands in Tanzania, respectively. The prevalence of *D. latum* 19 (12.67%) is lower compared to the 39.89% reported by Pam et al. (2013) in Vom, Plateau State. *Isospora* spp. had a prevalence of 8 (5.33%); this however agrees with reports of Ehimiyein et al. (2018) who reported a prevalence of 1.644% in Zaria.

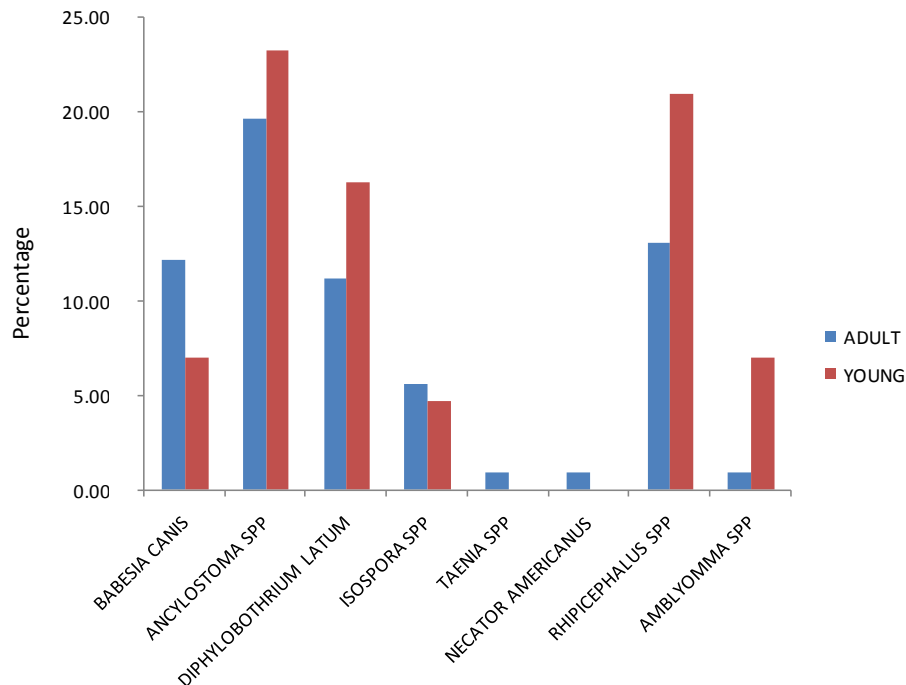


Figure 4. Prevalence of endo and ectoparasite based on age.

Taenia spp. had a prevalence of 1 (0.67%); this is in disagreement with the report of Ehimiyein et al. (2018) who reported a prevalence of 19.67% in Zaria and Mustapha et al. (2016) who had 7.3% in Maiduguri. *N. americanus* also had a prevalence of 1 (0.67%) in this study. This agrees with the 3% reported by Tion et al. (2016) in Makurdi. This parasite is usually found only in humans, but has been reported on rare occasions in other mammals. *N. americanus* is one of the soil-transmitted helminths that occurs worldwide and is particularly of importance in tropical and subtropical countries that have high levels of poverty in Asia, sub-Saharan Africa and the Americas (Haralabides et al., 1988; Horton, 2003). The difference in frequency of gastrointestinal parasite infection between different researchers could be due to differences in climatic factors required for the biology of the parasite, veterinary facilities, poor management practices and public awareness to take care of dogs (Yacob et al., 2007; Ugbomoiko et al., 2008).

B. canis was the only haemoparasite recorded in the study with 10.67% prevalence; this agrees with the 8.9% prevalence reported by Jegede et al. (2014) and Obeta et al. (2009) who reported 11.66% in Abuja during October to December and 10.2% reported by Amuta et al. (2008) in Makurdi but disagreed with the 42.1% previously reported by Kamani et al. (2011) in North Central Nigeria, Edosomwan and Chinweba (2012) who recorded prevalence of 28.0% in Benin city Southern Nigeria and Ogunkoya et al. (2006) with 62.7% prevalence in Zaria.

The reason for these variations could be due to the sample size, the season of the year in which the research is being carried out, management system and also based on and clinical status of the researched dogs (Ogunkoya et al., 2006).

The prevalence of endo and ectoparasite of dogs based on location showed that gastrointestinal parasites were more prevalent in Bukuru dog market than Dawaki dog market with *Ancylostoma* spp. having the highest prevalence 24.00% and *Isoospora* spp. 5.33% had the least as compared to Dawaki dog market which recorded slightly low prevalence with *Ancylostoma* spp. having 17.33% while *Taenia* spp. and *N. americanus* had the least 1.33% each. However, ectoparasite recorded higher prevalence in Dawaki market with *Rhipicephalus* spp. 18.67% while Bukuru had 12.0%, *Amblyomma* spp. in both locations had the same prevalence 2.67%. Haemoparasite on the other hand had only *B. canis* in both locations where Dawaki had a higher prevalence 13.33 and 8.00% in Bukuru dog market.

The reason for the high prevalence of gastrointestinal parasite in Bukuru dog market could possibly be due to the practice of feeding dogs with raw or undercooked offal from abattoir and the prevalence of ecto and haemoparasite in Dawaki dog market could be due to low level of education and level of awareness of farmers on the management practices.

However, the rate of infection is more among the male than female but female have high gastrointestinal parasite load than their male counterpart. This agrees with the

earlier studies carried out by some researchers that sex generally does not play a major role in the susceptibility to parasitic infections in dogs (Omodu and Amuta, 2007) and it could be to the stray ability of male dogs especially local dogs which predisposes them to parasitic infection.

Based on age the rate of haemoparasite infection is more in adults than the young with 12.15% adult and the young with 6.97%. This agrees with the reports of Obeta et al. (2009) who recorded a higher prevalence of blood parasite among older dogs than the young. However, there was a higher prevalence of gastrointestinal in the young than the adult with *Ancylostoma* spp. having 23.25% than the adult with 19.62% and other gastrointestinal parasites followed the same trend also for ectoparasite *Rhipicephalus* spp. had a higher prevalence in young than the adult with 20.93% and the adult having 13.08%. The reasons for these variations could be because of the chance of puppies being infected with gastrointestinal parasite transplacentally, orally from larvae adhering to the teat and ingestion of larvae with colostrum and lack of immunity or resistance associated with older dogs as a result of frequent exposure to infection.

Conclusion

The ecto and endoparasites detected in this study were *B. canis*, *Ancylostoma* spp., *D. latum*, *Isoospora* spp., *Taenia* spp., *N. americanus*, *Rhipicephalu* spp. and *Amblyomma* ticks, an obvious indication that endo and ectoparasites affect the general health and productivity of dogs in the study area in which some of them are of public health importance.

Recommendations

Dog owners should regularly deworm and spray or dip their pets with an acaricide solution to reduce worms and tick-borne diseases. Also, fumigation of dog kennels and houses would help to reduce the occurrence. Meat and fish should be properly cooked before serving to pets. Dog handlers in the markets should handle dogs with care to avoid contacting any infection from the dogs and finally a regular visit to the veterinary clinic is highly recommended.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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