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Prevalence of Gastrointestinal Parasites of Dogs among Four Communities in Ondo West LGA

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Abstract:
Dogs have close contact with humans, which represents a serious potential source of direct transmission of parasites to man. Gastrointestinal parasites are a major impediment to dog health worldwide through direct and indirect losses. Most dogs are sub-clinically infected and continuously shed infective helminth eggs in their faeces, contaminating the environment and increasing health risks to man. In developing countries like Nigeria, the risks of zoonotic infection from dogs are high, owing to the lack of prevalence studies to determine their existence in the environment. The aim of this research is to determine the prevalence and extent of gastrointestinal parasites in healthy dogs, survey the types of gastrointestinal infestation in dogs kept by owners in the study area, determine the effect of sex, types and location of dogs in the prevalence of gastrointestinal parasites and prevalence of gastrointestinal parasite in Ondo city. A total number of 122 samples were examined. 30 were positive with 15 protozoan species, namely: Ancylostoma caninum, Capillaria boehmi, coccidia, oocyst, cyistoisospora canis, Dipylidium caninum, Toxocara canis, Trichuris vulpis, Toxascaris leonina, Paragonimus kellicotti, Physaloptera sp, Uncinaria sp, Sarcocystis spp, Taeniasp, Spirocerci lupi and Eimeria sp with Capillaria sp having the highest prevalence and Paragominus sp (3.3%) with the least prevalence. Out of the four sample sites, Ajue had the highest prevalence with (35%), Laje (28%), Ondo Town (20%) and Bagbe with the least prevalence of (20%). From the breeds examined, the local breeds had the highest prevalence of gastrointestinal parasites (40.8%), cross-breeds (15.2%) and exotic breeds had the least prevalence (12.5%). Based on their age group, puppies less than 1 year had a high prevalence of infection at (25%), while the adult had a prevalence rate of (23.8%). In relation to the sex of the dogs, the prevalence rate was higher in males (25%) than in females (24%). This study indicates possible means of zoonotic infections if dogs are not properly cared for or treated, especially young puppies who have been around for less than one year.

Keywords: *Capillaria sp, ancylostoma caninum, dipylidium caninum, coccidia, paragonimus kelicotti zoonotic infection, dogs*

1. Introduction

Gastrointestinal parasitic diseases are considered the main factor affecting the health of household pets, especially dogs (Sudan *et al.,* 2015). Gastrointestinal parasites can generate subclinical diseases or chronic cases that impact animal health and could cause death; in addition, some of these parasites represent a potential risk for the human population, mainly in places where dogs do not receive adequate medical attention (Encala-da-Mena *et al.,* 2011). The main source of contamination is the faecal matter of dogs disseminated in the environment. Hence, the most vulnerable population is children who are exposed to areas where dogs and cats defecate and those who own domestic animals that do not receive adequate veterinary care (Camaño*et al.,* 2010). Canine intestinal parasites have a global distribution; their prevalence varies according to regions, times of year, cultural patterns and diagnostic techniques (Llanos *et al.,* 2010).

The domestic dog (*Canisfamilaris*) is the first domesticated mammal to co-exist with a man in all eras and cultures since the days of the cave dwellers. Dogs play an important role in public health, acting as reservoirs and transmitters of parasites. Many canine gastrointestinal parasites eliminate their dispersion elements (larvae, eggs and oocyst) by the faecal route. Dogs are known to transmit zoonitic diseases to man, such as hydatidosis caused by Echinococcus species, visceral larva migrans caused by *Toxocara canis* and cutaneous larva migrans caused by *Ancylostoma species* (Idika*et al.,* 2017; NigatuKebede, 2019).

Dogs are wonderful companions and sources of consolation for persons who live alone since they provide us with a sense of emotional being. With benefits for pet owners like reduced blood pressure, tension, and anxiety, resulting in a reduced risk of diseases like mental health disorders and coronary health diseases, dog ownership has been linked to

enhanced human physical and psychological health McConnell *et al. (*2011), Collis *et al*. (2012) and Hussein *et al*. (2021). Furthermore, the low level of hygienic conditions, lack of sufficient veterinary attention and zoonotic disease awareness compounds the risk of transmission of the diseases to humans. Dogs have close contact with humans, and this represents a serious potential source of direct transmission of parasites from dogs to man (Itoh *et al.,* 2009).

Dogs *(Canisfamiliaris*) have a close association with humans, providing security, companionship, and dietary protein requirements (Chidumayo, 2018). Dogs have been associated with more than 60 zoonotic diseases (Johnson *et al.,* 2015). Helminthosis reportedly takes significant importance worldwide in veterinary and public health (Sager *et al.,* 2016). Different types of enteric parasites have been reported, but *Ancylostomacaninum*, *Toxocaracanis*, *Dipylidiumcaninum*, *Trichurisvulpis*, and *Echinococcus spp*. are the most common (Ayimode*et al.,* 2016). These infections exert serious health challenges in dogs and have a variety of clinical signs such as unthriftiness, malaise, irritability, mild diarrhoea, melena, vomiting, anorexia, anaemia, and poor hair coat, ranging from the type of infection and density of the parasite. However, the infection may be asymptomatic (Degefu*et al.,* 2012).

Dogs are the most popular pet animals worldwide, and numerous reports have implicated dogs as hosts of important zoonotic intestinal parasites. Direct contact with infected dogs or exposure to environments contaminated with infected dog faeces are the two main ways these infections are spread to humans; alternatively, the larvae can enter the skin of the susceptible host (Degefu*et al.,* 2012). Wind, rain, arthropods, people, and automobile traffic are other elements that significantly contribute to the spread of these illnesses to humans. These elements can facilitate the passage of the infectious stages of parasites found in canine faeces to human food and water sources. Children are more at risk of contracting the virus or are more vulnerable to it. *Toxocara spp*. infections in humans are asymptomatic, while some people may experience ocular toxocariasis and visceral larval migrans. *Ancylostoma* species have been linked to eosinophilic enteritis in humans and have been described as an etiological agent for cutaneous larval migrans (Chidumayo, 2018). In Nigeria, several reports exist on the endemicity of the infection in various states of the country across various geographical distributions (Magaji*et al.,* 2012). However, there is a paucity of information on the prevalence, risk factors, and public health significance of zoonotic infection to the human population, especially when there is an increase in dog population for security, hunting, and breeding purposes, especially in developing nations. This study aimed to provide information on gastrointestinal parasites of dogs and their risk factors and zoonotic implications to human health in Ondo State, Nigeria.

2. Methodology

2.1. Description of the Study Area

Ajue, Bagbe, Laje and Ondo town are towns in Ondo West local Government Area of Ondo state. The inhabitants are mainly farmers, while others are traders, students and civil servants. They are a very superstitious community that does not allow the collection of faecal samples from their dogs to be examined for parasites. One hundred and twenty-two samples were collected with most of the dogs not given broad spectrum drugs or any other type of drugs.

2.2. Study Sampling and Sample Collection

The study was carried out in Ondo West LGA, which has a temperature ranging from 21ºC to 29ºC with an annual rainfall of roughly 1300mm. It was situated between latitudes 4.80º and 4.50ºN and longitudes 7.10º and 7.60ºE Akinyemi and Andreas (2011). It is located in Nigeria's tropical savanna vegetation zone, which has distinct dry (Nov–Mar) and wet (April–Oct) seasons. The study areas are Ajue, Bagbe, Laje and Ondo town. The households in the four towns were visited, and four abattoirs, namely: Oka, legiri, and Okagula and markets, namely Moferere, Okelisa, and Odojomu, were visited, respectively.

The Head of Department of Biological Sciences from the University of Medical Sciences Ondo was also visited for permission to store samples in their laboratory refrigerator for storage.

Faecal Samples were collected by inserting of hand into the anus of puppies to avoid contaminating the faecal samples using hand gloves, and some were collected during the early morning of 10:00hrs and 13:00hrs using a well-labeled nylon bag for storage. Questionnaires were used in the collection of data from dog owners to assess the age, breed, sex, and use of spectrum and anti-helminthic drugs from the dog owners.

The samples collected were One hundred and twenty-two faecal samples (122) were from the sample sites and taken to the laboratory within 24 hrs of collection and were kept in a refrigerator under 4^{0}C and examined within 48 and 74 hrs in the animal production laboratory FUTA.

2.3. Larvae Extraction

2.3.1. Sedimentation Technique

Two to four grams (2g – 4g) of faecal sample was placed in a beaker (50ml), and 20 mls of distilled water was added and mixed thoroughly. The mixture will be filtered through a mesh size (40mm) into another beaker to remove debris. The filtrate was then transferred into a centrifuge and spun at 1500rpm for 5 minutes, the supernatant was decanted. The sediment was stained with iodine solution and mounted on a glass slide. The slide was examined for parasite eggs/larvae under a microscope at x40 and x100 magnification.

2.3.2. Flotation Technique

Two to four grams (2g–4g) of the faecal sample was placed in a test tube, saturated sodium chloride (NaCl) solution was added to the sample until about one-quarter full, and it was shaken thoroughly. The test tube was placed on a test tube rack, and more solution was added with the aid of a pipette until a meniscus of the mixture was levelled to the opening of the test tube, and it was left undisturbed for 20 minutes. A sterile glass slide will be held horizontally over the tube and lowered such that it touches the surface of the meniscus. The slide was observed using an electron microscope at x100 and x40 magnification and then examined for the presence of parasitic eggs/larvae, and identification was done using standard morphological keys (CDC, 2014).

3. Data Analysis

Descriptive statistics in the form of graphic percentage expressions (Swai*et al.,* 2010) are presented as tables. The data collected will be analyzed using Statistical Package for the Social Sciences (SPSS) version 20.0, and Chi-Square analysis will be used to determine associations such as age, location, breed and sex.

4. Results

A total of 122 faecal samples were collected from four locations in Ondo West Local Government area and were examined, out of which thirty (24.6%) were positive for larvae or ova of one or two parasites. The highest prevalence was *Capillaria sp* (10%), *Ancylostoma caninum* (6.6%), Cystoisospora (6.6%), *Coccidia oocyst* 6.6%, *Dipylidium caninum* (6.6%), *Sarcocystis* sp (6.6%), *Spirocerca lupi* (6.6%), *Taenia sp* (6.6%), *Trichuris vulpis* (6.6%), *Toxocara canis* (6.6%), *Physaloptera sp (6.6%)*, *Emeria sp* 6.6%, *Unicinaria sp* (6.6%), *Toxocaris leonina* (6.6%) and the least was *Paragonimus kellicotti* (3.3%) as indicated in table 6. and the P<0.05 shows there is no significant difference. 105 of the 150 questionnaires that were printed for this study were distributed to the respondents. With regard to the use of broad-spectrum drugs, 50 dog owners utilize them (prevalence rate: 46.6%), while 55 do not (prevalence rate: 52.4%). From the 105 responses, 30 (28.3%) consult a technician, 40 (38.1%) consult a veterinarian, and 35 (33.3%) do not consult at all. However, out of the 105 respondents, 45 (42.9%) had never been de-wormed, which is the highest prevalence; 20 (19. 0%) de-wormed after three months, while 40 (38.1%) did so too after six months. On knowledge of zoonoses from the 105 respondents, 25 (23.8%) are aware, whereas 80 (76.2%) are not aware, with the highest prevalence. Those playing with children are high since out of the 105 respondents, 90 respondents have children with the highest prevalence (85.7%), and 15 have no children (14.3%). A total of 122 samples comprising 72 (25%) males and 50 (24%) females were examined. The males recorded more prevalence (25%) than the females (24%). This result agrees with the findings of Biu *et al*. (2012), Anosike *et al.* (2004) and Awoke *et al*. (2011), who reported in their findings that infections are more common in male dogs than in female dogs. The P < 0.09 shows there is no significant difference. From table 3, the P>0.003 indicates that there is a significant difference in the table. Of 122 faecal samples, 40 (12.5%) were exotic, 33 (15.2%) were cross-breeds and 49 (40.8%) were local breeds. This report agrees with Awoke *et al.* (2011) and disagrees with Anosike *et al.* (2004). Local breed owners manage the canine health of their dogs poorly with little or no anti-helminthic intervention unless the dog is obviously sick. Out of 122 faecal samples, it reveals that dogs less than one-year-old (puppies) have more prevalence at 80 (%) than adult dogs more than one-year-old with 42 (8.2%). This is also inconsistent with Abere *et al.* (2013), Swai*et al.* (2010) and Sowemimo *et al.* (2008). The P<0.885 shows there is no significant difference.

Location	Number Examined	Number Infected	Prevalence (%)
Ajue	20	7	35
Bagbe	30	6	20
Laje	32	9	28
Ondo Town	40	8	20
Total	122	30	24.6

Table 1: Prevalence of Gastrointestinal Parasites in Relation to Location
Chi-Square (χ^2) =2.180, df = 3, P = 0.536 (p >0.005)

Sex	Number Examined	Number Infected	Prevalence (%)
Male	72	18	25
Female	50	12	24
Total	122	30	49

Table 2: Prevalence of Gastrointestinal Parasites in Relation to Sex
Chi –Square (χ^2) = 0.016, df = 1, P = 0.900 (p>0.05)

Breed	Number Examined	Number Infected	Prevalence (%)
Exotic Breed	40	5	12.5
Cross Breed	33	5	15.2
Local Breed	49	20	40.8
Total	122	30	65.8

Table 3: Prevalence of Gastrointestinal Parasites in Relation to Breed
Chi–Square (χ^2) =11.696, df = 2, P > 0.003

Age	Number Examined	Number Infected	Prevalence (%)
Less than a year	80	20	25
Greater than a year	42	10	23.8
Total	122	30	48.8

Table 4: Prevalence of Gastrointestinal Parasites in Relation to Age
Chi-Square ($X2$) = 0.021, Df = 1, P= 0.885 (P>0.005)

Rearing Habit	Number Examined	Number Infected	Prevalence (%)
Pets kept at home	80	19	23.2
Stray dog	42	11	26.2
Total	122	30	49.4

Table 5: Prevalence of Gastrointestinal Parasites in Relation to Rearing Habitat
Chi-Square ($X2$) =0.088, Df = 1, P= 0.766 (P> 0.005)

Isolated Parasites	Number Isolated	Prevalence (%)
Ancylostoma caninum	2	6.6
Capillaria sp	3	10
Cociddia sp	2	6.6
Cystoisospora canis	2	6.6
Dipyllidium caninum	2	6.6
Sarcocystis sp	2	6.6
Spirocerca lupi	2	6.6
Taenia sp	2	6.6
Trichuris vulpis	2	6.6
Uncinaria stenocephala	2	6.6
Toxocara canis	2	6.6
Toxocara leonine	2	6.6
Paragonimus kellicoti	1	3.3
Physaloptera sp	2	6.6
Emeriasp	2	6.6
Total	30	100

Table 6: Prevalence of Isolated Parasites in the Study Area

Those Visiting Clinic	No. of Correspondents	Total No. of Questionnaires
No consulting veterinarian	40	105
No consulting technician	30	105
Non-consulting respondents	35	105
Those with children		105
No with children	90	105
No without children	25	105
Knowledge of zoonoses		105
No aware	25	105
No not aware	80	105
Use of broad-spectrum		105
No using broad-spectrum	50	105
No not using broad-spectrum	55	105
Those practising de-worming intervals		105
3-6 months	20	105
6months	40	105
Never de-wormed	45	105

Table 7: Results of Administered Questionnaires

5. Discussion of Findings

The prevalence of gastrointestinal parasites in dogs in the Ondo West local government area is presented for the first time in this study in the state. The total prevalence obtained was 25%. Higher prevalence was obtained in studies reported by Davous *et al*. (2009) in north-east Gabon at (94.1%), Eguia-Aguilar *et al*. (2005) in Mexico at (85%) and Lavellen *et al*. (2011) in Argentina at (89.13%). On the other hand, studies by Umar (2009) in Kaduna State, Nigeria (93.8%), Kebbi (78.85%), Magaji et al. (2012), Enugu (68.5%), Anene *et al*. (1996) and Sowemimo and Asaolu (2008) in Ibadan reported lower prevalence with (24%). These variations may be due to geographical locations, healthcare and

management principles, and the use of dogs as a source of meat in the study sites, which made it difficult to assess some dogs in markets and localities. Prevalence of gastrointestinal parasites in relation to location, as presented in table 1, Ajue showed the highest prevalence of gastrointestinal parasites (35%) in which 20 faecal samples were examined, and 7 were found positive, while among 32 faecal samples found in Laje, 9 positives were found which gave (28%). Ondo Town and Bagbe had the lowest prevalence (20%), in which 40 and 30 faecal samples were examined with 8 and 6 positives. The prevalence of Gastrointestinal parasites in relation to sex, as represented in table 2, showed that 72 male dogs were examined, with 18 infected (25%), while out of the 50 females examined, 12 were infected, given a total of (24%). The prevalence of the parasites was higher in males than in females, and this is due to the aggressiveness of male dogs. They always feast on the majority of the faeces and garbage without allowing the female dogs to partake or have a share in the garbage. This is consistent with the findings of Biu *et al*. (2012), Anosike *et al*. (2004) and Awoke *et al*. (2011), who reported in their findings that infections are more prevalent in male dogs than in female dogs. The independent T-test shows that there is a strong relationship between the male and the female at a p-value of 0.05. So, there is a significant difference.

The result on the basis of the breed, as indicated in table 3 above, showed that local breeds had a higher prevalence (40.8%) than cross (15.2%) and exotic (12.5%) breeds. The local breeds are not treasured by their owners and keepers; they are allowed to roam from place to place in search of food and games Aiyedun and Olugasa (2012), thus getting exposed to the infective stages of different helminths and intermediate hosts. Mostly, some of them are also used for hunting, which also increases their risk of infection; local breed owners also manage the canine health of their dogs poorly with little or no anti-helminthic intervention except if the dog is obviously sick. This also agrees with Satyal *et al*. (2013). The independent T-test shows that there is a moderate relationship among local, cross and exotic breeds at a p-value of 0.003, and there is no significant difference. This finding is inconsistent with Awoke *et al*. (2011), Idika *et al*. (2017) and Pam *et al*. (2013) but disagrees with Uwakwe *et al.* (2019), who stated that cross-breed dogs had a higher prevalence rate among both exotic and local dogs. The independent T-test shows that there is a moderate relationship between exotic, cross, and local breeds, so there is no significant difference. Table 4 shows that dogs less than one year had a higher prevalence (25%). This may be due to the low formation of the immune system of young dogs and the effect of lactation, which is the major route of parasite transmission to the young dogs and also potential stress factors associated with moving to a new home and weaning Martinez–Carrasio *et al.,* (2007) than the dogs above one year (23.8%). This is because parasite-specific immunity is usually acquired at an advanced age or probably due to single or repeated exposure (Ramirez *et al*., 2004). This finding agrees with Lloyd and Soulby (1983) and Bobade *et al*. (1984) but disagrees with the report of Ezeokoli (1984) and Yacob *et al.* (2007) in Ethiopia, who stated in their report that there is a higher prevalence in adult dogs than in younger ones, the independent T-test shows that there is a strong relationship between dogs less than a year and dogs greater than a year at p-value 0.005. Based on the habitat, as indicated in table 5, the stray dogs had a higher prevalence (26.2%) than the pets kept at home by their owner (23.2%). However, in this study, there is a clear indication that the number of stray dogs sampled was lower than the domesticated ones due to limited access to the dogs. Although previous studies showed that dogs on the street or in breeding facilities are more infected with parasites than dogs kept at home, Bugg *et al*. (1999) and Palmer *et al*. (2008). Stray dogs also harboured at least one species of gastrointestinal parasites, which shows a significantly high prevalence of parasites, and this is inconsistent with Glarekhan (2014), Simonato *et al*. (2015), Kostoplov *et al*. (2017) and Raza *et al*. (2017) that showed a high level of parasitism in this category of dogs. This finding is due to the lifestyle of these animals, which is characterized by a lack of care.

The prevalence of isolated parasites in the study area is indicated in table 6. In the same dog, concurrent parasite infection was observed in more than one species of intestinal parasite.

Table 6 shows that the isolated parasites were *Capillariasp* larvae 10% with the highest prevalence*, Ancylostoma caninum* 6.6%, Cystoisospora sp 6.6%, *Coccidia oocyst* 6.6%, *Dipyllidium caninum* 6.6%, *Sarcocystis* 6.6%, *Spirocercalupi* 6.6%, *Taeniasp* 6.6%, *Trichuris vulpis* 6.6%, *Toxocara canis* 6.6%, *Physaloptera sp 6.6%*, *Emeria sp* 6.6%, *Unicinariasp* 6.6%, *Toxocaris leonina* 6.6% and the least was *Paragonimus kellicotti* 3.3%. This is consistent with the reports of Aleskandra (2008), Swai (2010), Sowemimo and Asaolu (2008), who recorded mixed infections in their prevalence studies 105 of the 150 questionnaires that were printed for this study, were distributed to the respondents. With regard to the use of broad-spectrum drugs, 50 dog owners utilize them (prevalence rate: 46.6%), while 55 do not (prevalence rate: 52.4%). Out of the 105 responses, 30 (28.3%) consult a technician, 40 (38.1%) consult a veterinarian, and 35 (33.3%) do not consult at all. However, out of the 105 respondents, 45 (42.9%) had never been de-wormed, which is the highest prevalence; 20 (19. 0%) de-wormed after three months, while 40 (38.1%) did so too after six months. On knowledge of zoonoses from the 105 respondents, 25 (23.8%) are aware, whereas 80 (76.2%) are not aware, with the highest prevalence. Those playing with children are high since out of the 105 respondents, 90 respondents have children, with the highest prevalence of 85.7%, while 15 have no children, with a prevalence of 14.3%.

6. Conclusion

This study shows that *capillaria sp.* has the highest prevalence, followed by Coccidia *oocysts.*

It also revealed that most of the pets kept at home were treated using a broad Spectrum while stray dogs were not, suggesting that dog owners and sellers should be sensitized concerning de-worming practices.

This study indicates possible means of zoonotic infections if dogs are not properly cared for or treated, especially young puppies that are less than one year old. In conclusion, the results revealed a high prevalence of gastrointestinal parasites at Ajue and Laje, respectively. Consumption of improperly cooked dog meat should be avoided through continuous sensitization and enlightenment campaigns. Also, one health approach is encouraged to eradicate and control zoonotic diseases.

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