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A survey on intestinal nematodes of dogs in Uyo, Akwa Ibom State, Nigeria
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A survey on intestinal nematodes of dogs in Uyo, Akwa Ibom State, Nigeria

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To determine the prevalence of intestinal nematodes of dogs in Uyo, Akwa Ibom state, Nigeria, faecal samples from two hundred household dogs and fifty gastrointestinal tracts (GIT) from dogs slaughtering houses were collected and analyzed using standard parasitological methods of diagnosis. Out of the two hundred and fifty dogs examined, 195 (78.0%) were infected with different species of intestinal nematodes, of which 176 (90.3%) were positive for single infection. Mixed infections with two or more species of nematode parasite were identified on 19 (9.7%) dogs. The species of nematode parasites identified were: Ancylostoma caninum (55.4%), Toxocara canis (23.6%), Trichuris vulpis (9.2%) and Toxascaris leonina (2.1%). The prevalence was significantly higher in male dogs (57.4%) than females (42.6) (P<0.05). Puppies (<37 months) had significantly higher prevalence (80.8%) than the older ones (19.2%) P<0.05. The prevalence in relation to breeds of dogs recorded on local, cross and exotic were 78.7, 58.9 and 41.7%, respectively (P<0.05). The study discovered that most individuals are not aware of helminthic zoonosis associated with dogs, hence the poor hygiene practice in kernels and lack of proper veterinary attention to dogs. Hence, the need for public health enlightenment on the zoonotic potentials of dogs used as pet or hunting.

Key words: Intestinal nematodes, prevalence, dogs, Uyo, Akwa Ibom State, Nigeria.

INTRODUCTION

The domestic dog (Canis lupus familiaris) adapted to human habitation as early as 100,000 years ago, is the most successful canidae (Savolainen et al., 2002; Lindblad-tok et al., 2005). This is largely attributed to their several usefulness which include; hunting, security purposes, religious rituals and meat delicacy, as well as companion to man (Anosike et al., 2000; Adamu et al., 2012).

Despite the benefits, dogs remain a major threat to public health as they harbour a variety of intestinal parasites that are zoonotic which could be ascribed to their feeding habits, socio economic status of their owners, improper housing, poor feeding and absence of medication (Ezeokoli, 1984; Hendrix, 2003; Mahmuda et al., 2012).

Like many other domestic animals, dogs are exposed to a number of parasitic infections acquired as a result of their feeding habits, bites of parasitic arthropods and
contact with other infected domestic animals (Okon et al., 2011). Heavy infection of helminths parasites hinders the successful raising of dogs resulting in losses manifested by reduced resistance to other infectious agents, deprived growth, weight and protein loss, lowered work and feed efficiency, general ill health, anaemia, and sometimes death if not treated (Soulsby, 1982; Coati et al., 2003; Taylor, 2007; Canto et al., 2010; Idika et al., 2017). Ascarids (Toxocara canis) and hookworms (Ancylostoma species) are common intestinal parasites of dogs, mostly diagnosed in puppies (young dogs) because of the occurrences of both transplacental and transmammary transmission of Toxocara canis (Adejoke, 2005; Awoke et al., 2011), and have been incriminated in the transmission of zoonotic infections such as myiasis, echinococcosis, toxoplasmosis and rabies (Udonsi, 2002; Anosike et al., 2004; WHO, 2010).

However, these parasites are transmissible to man and other domestic animals, and the increase risk of transmission has been associated with several factors, some of which include; poor level of hygiene, overcrowding, lack of veterinary attention and zoonotic awareness (Malgor et al., 1996; Robertson et al., 2000; Molyneux, 2004).

There are documented reports on the intestinal parasites of dogs in Nigeria, with differences in prevalence depending on the geographical location (Anene et al., 1996; Adegbulu, et al., 2015). Not much has been done in Uyo, Akwa Ibom State, as people in the area constitute a large population of dog owners and dog meat consumers (Simon, 1994; Murray, 2007; Volk, 2007). The study aims to determine the prevalence and distribution of nematode parasites of dogs in Uyo, Akwa Ibom state.

MATERIALS AND METHODS

Study area

This study was conducted in Uyo Metropolis, the capital city of Akwa Ibom State, Nigeria. Uyo is located on latitude 5.02° North and longitude 7.92° East. This is within the tropical belt with evergreen foliage of trees, shrubs and oil palm trees, and distinctive two climatic seasons namely, the wet season which lasts between April and October and dry season which last between November and March. The dry season experiences harmattan during December and January. It has an annual rainfall of 3300 mm with landmass of 95km² (Udotong et al., 1997). According to the 2006 census, the population of Uyo is estimated to about 1.1million and the indigenes are mainly the Ibibio speaking tribe. As a center of commerce, the population increases everyday due to high level of rural - urban migration. The inhabitants are public servants, traders and farmers.

Study animal

The study animals used were dogs of all ages, breeds and sex found within Uyo metropolis. Faecal samples were collected from 200 household dogs, while fifty (50) gastrointestinal tracts (GIT) of dogs slaughtered for food, were collected from dog’s meat market within Uyo for the period of eight months, ranging from September 2014 to April 2015 for the study. The dog owners (respondents) were also administered questionnaires in order to obtain information on zoonotic awareness such as knowledge of possible mode of transmission, mode of disposing dog faeces and veterinary services (management system). Dog’s owners within Uyo were visited and consent was sought and obtained from them, prior to the survey. Sex of the dogs was determined by direct observation of their genital organs, while age was either recorded based on dental examination (Coleman, 1997; Aiello and Moses, 2012), or with the help of most houses showing the birth certificates of their dogs issued from veterinary clinic centers (Anosike et al., 2004).

Sample collection

Two sampling sites were used, households in Uyo and dog meat markets. The faecal samples of dogs were collected into sterile sample bottles. Each of the samples was clearly labeled with animal identification number, date of collection, place of collection, sex, age and breed of dogs. The samples were later transported to Department of Animal and Environment Biology Laboratory, University of Uyo, Uyo, Akwa Ibom State Nigeria for analysis.

Faecal samples of dogs from household

Households with dogs were randomly selected. Five grammes of fresh faecal samples were collected immediately it was passed out by the target animal into sample bottles. These samples were transported in cold ice pack to the laboratory and analyzed for parasitic nematodes using floatation method as described by Soulsby (1982).

Samples of GIT of dogs

Gastrointestinal tracts of dogs slaughtered in Uyo dog meat market were randomly collected immediately after slaughtering. Each GIT was ligated at the gastro-esophageal and recto-anal junctions and then transported to the laboratory for analysis. Sample not analyzed were stored in the freezer at -4°C.

Laboratory analysis of samples

Each faecal sample was processed using floatation and sedimentation methods as described by Soulsby (1982), while the gastrointestinal content was processed for helminthes using a modification of the method described by Jones et al. (2011) and Ogbaje et al. (2015). All nematodes encountered were identified according to Soulsby (1982) and Blagburn (2010).

Statistical analysis

The data obtained were analyzed using Statistical Package for Social Science (SPSS) Version 20. A two way contingency test (Chi square) was performed to assess the prevalence of the nematode parasites, using 95% confidential interval to test for significance.

RESULTS

A total of 250 dogs were examined, made up of 200 household and 50 slaughtered dogs. The overall prevalence of infection was 78.0% (195/250). The
Table 1. Prevalence of infection between slaughtered and household dogs in Uyo (September 2014 to April 2015).

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. of samples examined</th>
<th>No. of infected samples</th>
<th>% prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIT samples from slaughtered dogs</td>
<td>50</td>
<td>38</td>
<td>76.0</td>
</tr>
<tr>
<td>Faecal samples from household dogs</td>
<td>200</td>
<td>157</td>
<td>78.5</td>
</tr>
<tr>
<td>Total</td>
<td>250</td>
<td>195</td>
<td>78.0</td>
</tr>
</tbody>
</table>

($\chi^2=20.64$, degree of freedom (df) =1, $P<0.05$).

Table 2. Prevalence of infection in relation to sex (September 2014 to April 2015).

<table>
<thead>
<tr>
<th>Sex</th>
<th>No. (%) examined</th>
<th>No. (%) infected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Faecal samples</td>
<td>GIT samples</td>
</tr>
<tr>
<td>Male</td>
<td>112</td>
<td>31</td>
</tr>
<tr>
<td>Female</td>
<td>88</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>50</td>
</tr>
</tbody>
</table>

($\chi^2=17.52$, degree of freedom (df) = 1, $P<0.05$).

infected dogs were made up of 78.5% (157/200) household dogs and 76.0% (38/50) slaughtered dogs respectively as shown in Table 1. Out of the 250 dogs examined (143 males; 107 females), 195 (78.0%) were infected. Males 112 (57.4%) were more infected than females 83 (42.6%) at significant level; $\chi^2=17.52$, df = 1, $P<0.05$ (Table 2). Of the 195 (78.0%) infected samples, 176 (90.3%) were positive for single species of intestinal nematode infection (101 males; 75 females) while 19 (9.7%) had mixed-species infection (Tables 3 and 4). Ancylostoma caninum recorded the highest prevalence of infection of dogs; 108 (55.4%), while the least infection is Toxascaris leonina; 4 (2.1%). Also, intestinal nematode eggs recorded from infected samples of male dogs were statistically significant than females ($P <0.05$). A. caninum was highly significant in the faecal specimen of both male and female dogs (Tables 3 and 4).

DISCUSSION

This study shows that dogs of different age groups, breeds and sexes harboured various types of nematode parasites. The high prevalence of 78.0% observed in this study is similar to previous reports from studies elsewhere in Nigeria; Anosike et al. (2004), Okoye et al. (2010), Okon et al. (2011), Mahmuda et al. (2012) and Edet et al. (2014) with high prevalence of 81.9, 52.7, 69.0, 72.5 and 74.0% respectively, and other part of the world such as the Caribbean community (Thompson et al., 1986), Mexico (Aguilar-Eguia et al., 2005) and Ethiopia (Denjene et al., 2013). This present finding contradicts the lower prevalence reported in Argentina (Andresiuk et al., 2007), Ethiopia (Awoke et al., 2011), Spain (Ortuno and Castella, 2011) and part of Nigeria such as Maiduguri (Adamu et al., 2012) and Benin City (Edosomwan and Chinweuba, 2012). The difference in prevalence of intestinal nematode infections might be due to the differences in climatic factors required for the biology of the parasites, geographical location, veterinary facilities and public awareness, at which each of these investigation is carried out (Yacob et al., 2007; Ugboroimoiko et al., 2008).

This study, the males were significantly more infected than the females. This could be due to the free-ranging nature of the male dogs as reported by Anosike et al. (2004). This finding is at variance with work of Idika et al. (2017) which reported a higher prevalence in female dogs and attributed it to hormonal influence on immunity such as is the case when peri-parturient decreases animal’s immunity in pregnant and lactating female dogs compared to cross breeds with prevalence of 58.9% and followed by exotic breeds (41.7%).
Table 3. Distribution of intestinal nematodes observed in the infected sample of dogs in relation to sex (single species) (September 2014 to April 2015).

<table>
<thead>
<tr>
<th>Distribution of intestinal nematodes</th>
<th>Relative abundance</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Faecal samples (%)</td>
<td>GIT samples (%)</td>
<td>Total (%)</td>
</tr>
<tr>
<td>Ancylostoma caninum</td>
<td>92 (58.6)</td>
<td>16 (42.1)</td>
<td>108 (55.4)</td>
</tr>
<tr>
<td>Toxocara canis</td>
<td>36 (22.9)</td>
<td>10 (26.3)</td>
<td>46 (23.6)</td>
</tr>
<tr>
<td>Trichuris vulpis</td>
<td>14 (8.9)</td>
<td>4 (10.5)</td>
<td>18 (9.2)</td>
</tr>
<tr>
<td>Toxascaris leonina</td>
<td>2 (1.3)</td>
<td>2 (5.3)</td>
<td>4 (2.1)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>144 (91.7)</td>
<td>32 (84.2)</td>
<td>176 (90.3)</td>
</tr>
</tbody>
</table>

Table 4. Distribution of intestinal nematodes observed in the infected sample of dogs in relation to sex (mixed species) (September 2014 to April 2015).

<table>
<thead>
<tr>
<th>Distribution of intestinal nematodes</th>
<th>Relative Abundance</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Faecal samples (%)</td>
<td>GIT samples (%)</td>
<td>Total (%)</td>
</tr>
<tr>
<td>A. caninum + T. canis</td>
<td>7 (4.5)</td>
<td>3 (7.9)</td>
<td>10 (5.1)</td>
</tr>
<tr>
<td>A. caninum + T. vulpis</td>
<td>4 (2.5)</td>
<td>2 (5.3)</td>
<td>6 (3.1)</td>
</tr>
<tr>
<td>T. vulpis + T. canis</td>
<td>2 (1.3)</td>
<td>1 (2.6)</td>
<td>3 (1.5)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>13 (8.3)</td>
<td>6 (15.8)</td>
<td>19 (9.7)</td>
</tr>
</tbody>
</table>

Table 5. Prevalence of intestinal nematodes in relation to age of dogs.

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>No. of examined household dogs</th>
<th>No. of examined slaughtered dogs</th>
<th>No. infected (%)</th>
<th>Total examined</th>
<th>Total infected</th>
<th>% prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 12</td>
<td>85</td>
<td>18</td>
<td>16 (88.9)</td>
<td>103</td>
<td>93</td>
<td>90.3</td>
</tr>
<tr>
<td>13–24</td>
<td>48</td>
<td>12</td>
<td>8 (66.7)</td>
<td>60</td>
<td>43</td>
<td>71.7</td>
</tr>
<tr>
<td>25–36</td>
<td>37</td>
<td>8</td>
<td>6 (75.0)</td>
<td>45</td>
<td>32</td>
<td>71.1</td>
</tr>
<tr>
<td>37–48</td>
<td>9</td>
<td>4</td>
<td>3 (75.0)</td>
<td>13</td>
<td>9</td>
<td>69.2</td>
</tr>
<tr>
<td>≥ 49</td>
<td>21</td>
<td>8</td>
<td>5 (62.5)</td>
<td>29</td>
<td>18</td>
<td>62.1</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>50</td>
<td>38 (76.0)</td>
<td>250</td>
<td>195</td>
<td>78.0</td>
</tr>
</tbody>
</table>

(χ²=23.95, degree of freedom (df) = 4, P<0.05).

(Soulsby, 1982).  
The present study has shown that, *A. caninum* and *T. canis* were the most prevalent nematodes encountered in terms of single and mixed infection. This corroborates the reports of Ugochukwu et al. (1985) in Calabar, Mahmuda et al. (2012) in Sokoto, Traub et al. (2002) in India, Kudlang et al. (2010) in Jos, Denjene et al. (2013) in Ethiopia, Edet et al. (2014) in Ibiono Ibom,
Nigeria and Idika et al. (2017) in Enugu. This is attributed to the high fecundity of the female *Ancylostoma* sp. leading to heavy contamination of the environment with hookworm eggs and larvae, as well as their high infectivity in dogs of all ages (Soulsby, 1982, Idika, 2017). Also, *Toxocara* sp. on the otherhand, though highly fecund is mostly seen in young dogs as adult are relatively resistant to the infection (Bowman et al., 2003). The presence of these parasites are of great importance, as they are well recognized zoonotic agents which constitute a significant public health risk due to the frequent contact between humans and dogs (Ramirez-Barrios et al., 2004; Onwuliri et al., 1993). These parasites recorded are notably causes of anaemia, diarrhoea and slow growth, as well as toxocarasis (caused by *T. canis*) which may result in the death of puppies due to migrating larvae in lungs (Soulsby, 1982; Yacob et al., 2007).

However, the sources of infections are possibly cause of mixed infection in dogs which could be ascribed to poor sanitary condition and nutrition (Kutdang et al., 2010). More so, the low prevalence of *T. vulpis* and *T. leonina* could be attributed to the unfavourable climatic factors, such as temperature, humidity, rainfall, required for proper development and dispersion of these parasites in the area (Yacob et al., 2007).

Puppies within 36 months and below had more infections than older ones. This corresponds with earlier report of Anosike et al. (2000) in Ebonyi, Daryani et al. (2009) in Iran and Denjene et al. (2013) in Ethiopia, but differs from observations by Kahante et al. (2009) in Nagpur and Awoke et al. (2011), who reported no difference in infection between ages of dogs. The plausible explanation could be due to their low resistance and/or due to the possibility of pre-natal infection of the foetus via intrauterine and lactogenic routes (Soulsby, 1982; Okon et al., 2011). Most infection especially with hookworm (*A. caninum*) could be transmitted vertically in puppies. Furthermore, the high infection rate observed in the younger animals could be attributed to reduced immunity due to age and their voracious feeding habit which make them vulnerable to infection than older dogs.

This study revealed a higher prevalence in local breed, compared to the cross and exotic. This is because the local breeds are not properly cared for and as such become susceptible to different varieties of intestinal nematodes infections. Also, dog owners (local breeders) are not well-informed on the proper management routine and as such become prone to certain zoonotic diseases. Furthermore, the high prevalence observed in local dogs is attributable to the lack of anthelminthic treatments and proper monitoring, as this could make them prone to large numbers of intestinal nematodes at any age due to their greater exposure to the parasites. Infection in either cross or exotic breeds could be due to the fact that there is poor or carelessly managed pet shops or kernels where faeces are predominately allowed to accumulate. More so, different breeds of dogs demonstrated differences in their rate and intensity of infection, genetic variability and susceptibility of the breeds to the parasites might have accounted for this observation.

Information obtained during this survey, revealed that most dogs are used primarily as pets for security purpose and for consumption or commercial purposes. The survey further discovered that most individuals are not aware of helminthic zoonosis associated with dogs, hence the poor hygiene practice in kernels and lack of proper veterinary attention in this study. The importance of controlling feline parasite is not only to relieve clinical symptoms in infected dogs but also to minimize the zoonotic potential of larval nematode infections in human (Adejoka, 2005). There is need proper public health enlightenment on the zoonotic potentials of dogs used as pet or hunting.

**CONFLICT OF INTERESTS**

The authors have not declared any conflict of interests.

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