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Gastrointestinal Helminths of Local and Exotic Domestic Fowls in Ijebu-Ode, Ogun State, Nigeria

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ABSTRACT

Chicken remains the most intensively reared domesticated poultry species in the animal production industry in Africa. A cross-sectional study was conducted from April to November 2016 in Ijebu-Ode, Ogun State, Nigeria to evaluate the prevalence of gastrointestinal and malaria parasites of local and exotic domestic fowls. A total of 620 domestic fowls were examined for gastrointestinal parasites in Ijebu-Ode, Ogun State, Nigeria, using the flotation technique. Another 16 (10 exotic and six local) domestic fowls were examined for *Plasmodium* infection and Packed Cell Volume (PCV). Five species of parasites were identified from the domestic fowls which included *Ascaridia galli* (54.2%), *Heterakis gallinarum* (15.5%), *Capillaria* sp. (8.2%), *Raillietina* sp. (20.8%) and *Syngamus trachea* (1.4%). *Ascaridia galli* had the highest prevalence in both the local (male = 50%, female = 48.5%) and exotic domestic fowls (male = 62.5%, female = 55.7%), followed by *Raillietina* sp., *Heterakis gallinarum*, *Capillaria* sp. and *Syngamus trachea* respectively. *Plasmodium* sp. was detected in two (33.3%) out of six local domestic fowls and two (20%) out of 10 exotic domestic fowls. The relationship between the PCV and malaria parasite prevalence level in both local and exotic domestic fowls were negative and not statistically significant (p>0.05). However, the relationship between the PCV and malaria parasite prevalence was stronger in the local domestic fowls (R = 0.207) than in the exotic domestic fowls (R = 0.172). It is necessary that public awareness scheme, and prevention and control measures with better management system be introduced in the study area.

Keywords: Domestic fowls, Gastrointestinal parasites, *Plasmodium* sp., Prevalence, Packed Cell Volume

Poultry farming which includes chickens, ducks, guinea fowl, turkey and ostrich is a very important source of income to poultry farmers but enteric pathogens inflict colossal monetary losses in the form of high morbidity and mortality, decreased egg production and low meat quality (Hange *et al.,* 2007). Among these enteric pathogens, helminth parasites and haemoparasites assume tremendous economic importance as they are responsible for decreased weight gain of the host and egg production. Helminthes parasites of poultry are commonly divided into three main groups; nematodes, cestodes and trematodes. Nematodes and cestodes constitute the most important group of helminthic parasites of poultry both in number of species and in the extent of damage they cause. Their main genera include *Capillaria*, *Heterakis, Raillietina, Hymenolepsis* and *Ascaridia* (Jordan and Pattison, 1996; Oniye *et al*., 2001; Luka and Ndams, 2007; Pam *et al*., 2015; Lawal *et al.,* 2015a; Lawal *et al.,* 2015b; Shiferaw *et al.,* 2016). The trematodes of significant importance include *Echinostoma revolutum* and *Prosthogonimus* spp. (Permin and Hansen, 1998). Haemoparasites are also found in poultry in the tropical and temperate areas; they include *Plasmodium, Leucocytozoon, Haemoproteus, Aegyptinella* and *Trypanosoma* species (Arends, 2003). These parasites require arthropod vectors in their life cycle. The vectors include poultry ticks, mosquitoes and other flies (Permin and Hansen, 1998).

The domestic chicken mode of feeding on food substances (grains, fruits, insects) exposes them to harbored infective stages of parasites thereby predisposing them to parasitic

infection, particularly gastrointestinal parasites (Jegede *et al*., 2015). Gastrointestinal parasitic symptoms of infections in chickens include; retarded growth, reduced weight gain, decreased egg production, diarrhea, intestinal obstruction and poor feathers. Stress from parasites could affect the blood and cause anorexia (Dube *et al.,* 2010). Haemoparasites like *Plasmodium* sp. cause haemolytic anaemia, lymphocytosis, oedema of the lungs, dyspnea, loss of body weight, hepatomegaly and splenomegaly by invading the host's erythrocytes which are consequently destroyed by the bird's autoimmune system leading to death (Igbokwe *et al.,* 2008; Hasan *et al.,* 2017). This problem is more noticeable in local chickens which are usually reared using the open-range system. Although parasitic diseases are among the major factors that decrease productivity of chickens, they are often neglected as they are most times subclinical. However, there is a somewhat reduction in parasitic infection in commercial poultry production mostly due to improved housing, hygiene and management practices (Jegede *et al*., 2015). Still, the prevalence of gastro-intestinal parasites is very rampant. Though anti-helminth medications are highly effective, good sanitation and hygienic conditions reduces the chances of infections and diseases of organisms to a minimum.

Poultry production has remained the main stay of the Nigeria livestock production industry and a major contributor to the economy and the gross national product (GNP) as according to Lawal *et al.* (2015a), estimation showed that the country had about 130-150 million chickens. Extensive studies by Matur *et al*. (2010), Nnadi and George (2010), Uhuo *et al.* (2013), Ohaeri and Okwum (2013), Adang *et al.* (2014), Opara *et al.* (2014), Jegede *et al.* (2015) and Pam *et al.* (2015) have reported presence of various helminthic parasites in chickens in Eastern and Northern parts of Nigeria. However, there is paucity of information regarding the prevalence of gastrointestinal parasites of chickens in the South-Western region of Nigeria especially in the present study area where only Agbolade *et al.* (2014) reported an overall prevalence of 37.6% in some parts of Ijebu North Local Government Area of Ogun State in Nigeria. Also, few studies like Igbokwe *et al.* (2008) and Karamba *et al.* (2012) have reported *Plasmodium* sp. 11.4% in local chickens and 8.4% in exotic chickens in Borno State and 19.56% in local chickens in Kano State of Nigeria respectively. Lawal *et al.* (2016) reported a prevalence of 29.4% in Maiduguri Borno State, Nigeria. Knowledge of the epidemiological status of gastrointestinal parasites of chickens has some impact in the formulation of policies geared towards enhancing the health status of the birds. Therefore, this study aimed to provide more information on the status of parasites associated with local and exotic domestic fowls in Ijebu-Ode, Ogun State, Nigeria.

MATERIALS AND METHODS

Study area

Ijebu-Ode is on Latitude 6º49'15" N and Longitude 3º55'15" E, in Ogun State South-West Nigeria. The city is located 110 km by road north-east of Lagos; it is within 100 km of the Atlantic Ocean in the eastern part of Ogun State and has a warm tropical climate. The major ethnic group is the Ijebus and co-habited by several other ethnic groups such as the Hausas, Igbos and Igalas (Wikipedia, 2016).

Sample size and birds

Simple random sampling method was implemented for sampling of chicken. Sample size for the study was calculated using the formula by Beyene *et al.* (2014) with precision level of 5%, confidence interval of 95% and the expected prevalence of 50% since there was no similar study done previously on the study area. The study birds included 100 random exotic domestic fowls in each of five different poultry farms in the outskirt of Ijebu-Ode. Inclusion criteria included: Physically healthy looking birds and having been administered deworming medication prior to this study.

The poultry farms were F.A Feed mills Poultry Farm in Ijari (6.842ºN, 3.950ºE), Chief Rabiu Farms in Erigo (6.847ºN, 3.964ºE), O & K Farms in Ijari (6.846ºN, 3.938ºE), Adeyemi Farm in Erigo (6.847ºN, 3.972ºE), and Tola Farm in Erigo (6.847ºN, 3.976ºE) (Fig. 1). Consent of the poultry farm owners was obtained. In addition, 40 local domestic fowls from each of three different markets in Ijebu-Ode were used in the study. The markets were Oke-Aje market (6.801ºN, 3.921ºE), Ita-Osu market (6.801ºN, 3.909ºE) and Ita-Ale market (6.801ºN, 3.912ºE) (Fig. 1). Blood samples were also collected from 16 random

domestic fowls. These included two exotic fowls from each of the visited poultry farms and two local fowls from each of the markets. Fowls of different age groups and sexes were included in the study which occurred between April and November, 2016.

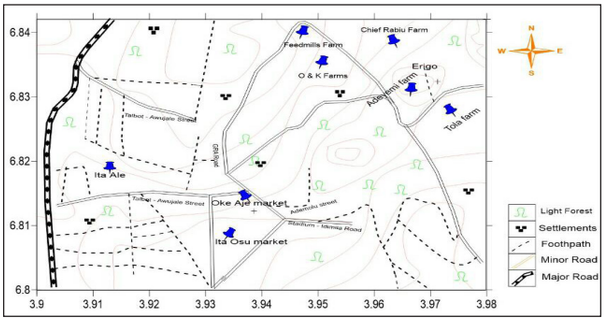

Fig. 1: Map of the study area in Ijebu-Ode, Ogun State Nigeria

Faecal sample collection and examination

The faecal samples were collected from the rectum of each study bird with a spatula which was thoroughly washed and wiped after each collection to avoid cross contamination. Each faecal sample was put into a clean labeled sampling bottles, the label indicated the name of the poultry, sex of the domestic fowls and sample collection date. In the laboratory, all faecal samples were examined using flotation technique (Soulsby, 1982). However, overfilling was avoided to avoid loss of floated materials. A clean glass slide was placed on the test tube and left for 25-30 minutes. The slide was then removed and a cover slip was placed on the area containing the eggs/cysts. Slides were examined with the light microscope using X40 magnification. Identification of the eggs/cysts was done based on their characteristic morphology (Bliss and Kvasnicka, 1997).

Blood sample collection

Five (5) ml of blood sample into heparinized bottles were taken from the brachial vein of birds using the procedure described by Karamba *et al.* (2012). The samples were stored in iced block to prevent coagulation and were then transported to the laboratory for Packed Cell Volume (PCV) and *Plasmodium* infection determination. The micro-haematocrit method was used to determine the PCV of the blood samples collected. The PCV was read with a haematocrit reader. The standard range used was 35.9 - 41.0%. Each of the blood samples was examined for *Plasmodium* infection using rapid diagnostic test method. Results were read after 15 minutes, with one line indicating negative and two lines indicating positive.

Data analysis

Data collected were analyzed using the Statistical Package for Social Sciences (SPSS) version 20.0 IBM Corp, 2011. Descriptive statistics of data was obtained. Student's Independent T-test was used to test for significant difference in the PCV values between gender and between local and exotic domestic fowls. Chi-square test was also used to evaluate the difference in parasite prevalence between gender and between the local and exotic domestic fowls. P value was set at 0.05.

RESULTS AND DISCUSSION

A total of 620 domestic fowls comprising of 120 local domestic fowls and 500 exotic domestic fowls were examined for gastrointestinal parasites from Ijebu-Ode, Ogun State, Nigeria. Parasites were higher in the male domestic fowls (63.3%) than in the females (58.3%). Similarly, male exotic domestic fowls were observed to have more parasites (41.6%) than in their females (39.6%). Percentage parasite positive domestic fowls were however recorded to be higher in the local domestic fowls (60.8%) than the exotic domestic fowls (40.6%) (Table 1).

Table 1: Intestinal parasite prevalence in local and exotic domestic fowls from Ijebu-Ode, Ogun State, Nigeria

Domestic fowls type	Sex	Number sampled	Number positive	Prevalence (%)
Local	Male	60	38	63.3
	Female	60	35	58.3
	Total	120	73	60.8
Exotic	Male	250	104	41.6
	Female	250	99	39.6
	Total	500	203	40.6
Total		**620**	**276**	**44.5**
Chi square (χ^2)		$\chi^2 = 16.09$; $p = 0.45$		$\chi^2 = 20.00$; $p = 0.22$

The prevalence of species of parasites by gender in domestic fowls (local and exotic) from Ijebu-Ode, Ogun State, Nigeria is presented in Table 2. A total of five (5) intestinal helminthes were identified from the domestic fowls during the study period. These included *Ascaridia galli, Heterakis gallinarum, Capillaria* sp., *Raillietina* sp. and *Syngamus trachea.*

Of all the parasites identified (Table 2), *Ascaridia galli* had a higher prevalence in both the local domestic fowls (male = 50%, female = 48.5%) and exotic domestic fowls (male = 62.5%, female = 55.7%). There was no significant difference ($p>0.05$) in parasite prevalence between sex and the type of domestic fowls. This was similar for parasite prevalence between the local and exotic domestic fowls.

Table 2: Prevalence of intestinal parasites species according to gender of local and exotic domestic fowls from Ijebu-Ode, Ogun State, Nigeria

	Local		Exotic	
	Male	**Female**	**Male**	**Female**
Ascaridia galli	77(50.0)	65(48.5)	75(62.5)	59(55.7)
Heterakis gallinarum	24(15.6)	17(12.7)	18(15.0)	20(18.9)
Capillaria sp.	15(9.7)	13(9.7)	9(7.5)	6(5.7)
Raillietina sp.	36(23.4)	37(27.6)	17(14.2)	19(17.9)
Syngamus trachea	2(1.3)	2(1.5)	1(0.8)	2(1.9)
Chi square (χ^2)	$\chi^2 = 16.09$; p = 0.45		$\chi^2 = 20.00$; p = 0.22	

The *Plasmodium* prevalence in local and exotic domestic fowls from Ijebu-Ode, Ogun state, Nigeria is presented in Table 3. The results showed that two (2) (33.3%) out of six (6) local domestic fowls were infected and two (20%) out of ten (10) exotic domestic fowls were infected with *Plasmodium* spp.

The linear regression showing the relationship between blood PCV levels and parasite prevalence in local and exotic domestic fowls is represented in Fig. 2. The relationships between the PCV and parasite prevalence level of both local and exotic domestic fowls were observed to be negative and not significant ($p>0.05$). However, the relationship between the PCV and parasite prevalence was stronger in the local domestic fowls (R = 0.207) than in the exotic domestic fowls (R = 0.172).

The results of this study revealed the prevalence of gastrointestinal parasites of local and exotic domestic fowls in Ijebu-Ode, Ogun State, Nigeria. Of the total population of domestic fowls examined from Ijebu-Ode, two hundred and seventy-six (276) representing 44.5% of the total domestic fowls examined were positive for various intestinal parasites. Percentage parasite positive domestic fowls were however recorded to be higher in the local domestic fowls (60.8%) than the exotic domestic fowls (40.6%).

Table 3: *Plasmodium* spp. prevalence in local and exotic domestic fowls from Ijebu Ode, Ogun State, Nigeria

Domestic Fowls	Sex	No of Birds Examined	No Infected (%)	Not Infected (%)
Local	Male	3	1(33.3)	2(66.7)
	Female	3	1(33.3)	2(66.7)
	Total	**6**	**2(33.3)**	**4(66.7)**
Exotic	Male	5	1(20)	4(80)
	Female	5	1(20)	4(80)
	Total	**10**	**2(20)**	**8(80)**
Grand Total		16	4(25)	12(75)

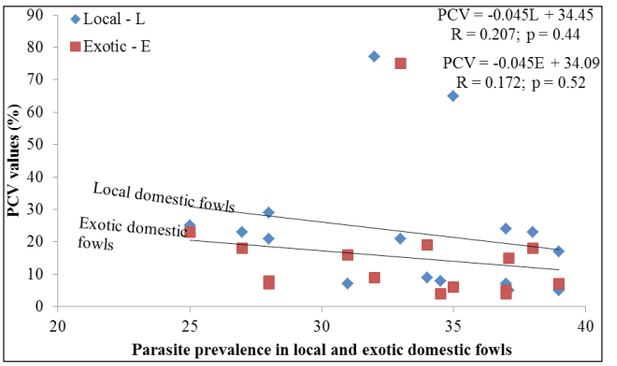

Fig. 2: Linear regression between blood PCV levels and avian malaria prevalence in local and exotic domestic fowls

The recorded high prevalence (60.8%) in local domestic fowls agrees with previous reports by Ohaeri and Okwum (2013) who reported 62.7%, Agbolade *et al*. (2014) who reported 87% and Idika *et al.* (2016) who reported 96.8% in Nsukka Nigeria. This high prevalence recorded in local domestic fowls could be an indication that the intermediate hosts of these parasites are highly present where these fowls are reared that they can be easily infected via their

diet when roaming long distances to search for food. This is also corroborated with Beyene *et al.* (2014) and Shiferaw *et al.* (2016) in Ethopia. Unfortunately, it is the practice of extensive management system of rearing domestic fowls that is more common and local domestic fowls are mostly reared than the exotic domestic fowls.

The considerable number of helminthes present in both local and exotic domestic fowls as revealed by the study is a great threat to their well-being hence affecting their productivity (Agbolade *et al*., 2014).

A total of five helminthes species were recorded in this study; four (4) nematodes (*Ascaridia galli, Heterakis gallinarum, Capillaria* sp. and *Syngamus trachea*), one (1) cestode (*Raillietina* sp.) were found to occur in both local and exotic domestic fowls, hence a clear indication that nematodes are the most prevalent parasites of domestic fowls. This concurs with previous study by Shukla and Mishra (2013); Katoch *et al*. (2012); Ohaeri and Okwum (2013) and Agbolade *et al*. (2014). However, this completely disagrees with findings of Adang *et al*. (2014) and Al-Jamiaen (2013) and Butt *et al.* (2014) that opined that cestodes were more prevalent. Comparatively, these species were found common to those reported by Agbolade *et al*. (2014). According to the results, although *Ascaridia galli* was more prevalent it does not conform to the findings of Agbolade *et al*. (2014) however, it confirms the findings of Shukla and Mishra (2013) and Katoch *et al*. (2012). *Ascaridia galli* causes larger chances of death in smaller birds as they belong to the group of Nematodes which constitutes an important class of helminthes parasites of poultry both in a number of species and in the level of damage, they caused (Khan *et al.,* 2016). The presence of more *Ascaridia galli* could be as a result of environmental climatic conditions and infective stages. High parasitic infections may be attributed to the poor handling and control efforts in either the animal or in the immediate environment where infection or re-infection may come from (Adang *et al*., 2014). This is however usually common amongst the local domestic fowls when little or no care are provided for.

Parasites species according to gender of local and exotic domestic fowls showed that *Ascaridia galli* had higher prevalence in both the local domestic fowls (male = 50%, female = 48.5%) and exotic domestic fowls (male = 62.5%, female = 55.7%). The findings that *Ascaridia galli* had higher prevalence in males agree with the study of Shukla and Mishra (2013). This is so because nematodes in their life cycle do not need intermediate hosts as they are soil transmitted parasites whereas cestodes requires intermediate host to complete their life cycle.

The absence of trematodes in this study in both local and exotic chickens was also reported by Adang *et al.* (2014) in Gombe State, Nigeria. This could be as result of limited exposure of the chickens to feeding on snail and fish feeds which could serve as intermediate hosts of trematodes in poultry. The presence of *Plasmodium* spp would be attributed to the presence of the vector which transmits the parasite in the environment. The presence of the vectors in the environment would be as a result of the dirty environment which aggravates its survival. To confirm anaemia in a bird, the PCV should be below the lower limit of the normal or reference range (Igbokwe *et al.,* 2008). The PCV range in healthy domestic chickens was 22 – 35% (Jain, 1993). Result observed was also similar with Igbokwe *et al.* (2008) where Packed cell volume (PCV) of uninfected and infected domestic chickens did not differ significantly.

This study has clearly indicated that local domestic fowls in Ijebu-Ode Local Government, Ogun, State carry a high burden of parasitic infections. The study revealed that female domestic fowls were more infected with helminthes parasites than the males in both local and exotic domestic fowls. This was similar with Lawal *et al.* (2015b) in Gombe metropolis. This might not be unconnected to their feeding. Female domestic fowls are known to be more voracious in their feeding habits especially during egg production than the male domestic fowls which remain largely selective. This is associated with their indiscriminate scavenging behavior. This could also be traced with warm environmental condition which create and support the eggs and early stage of development and hence increase survival and transmission of these parasites which was supported by the period of the research though not captured.

In conclusion, this work strongly suggests that backyard and free range domestic fowls are susceptible to high risk of helminthes (cestodes and nematodes) infection and therefore have high economic impact in the poultry production. Despite the absence of any veterinary care for local domestic fowls, their contribution to supply

of eggs, meat for household consumption and income generation cannot be mistreated. The impact of these helminthes on local and exotic domestic fowls should never be underestimated. Co-factors which trigger these parasitic diseases in the study area should be investigated. It is therefore necessary that farmers of domestic poultry be constantly educated on the need to put up control and preventive measures with better management system so as to boost the poultry production sector of agriculture. Eggs and meat should be boiled properly and the entire intestine properly disposed to avoid transmission of these helminthes diseases to man. Extensive studies on the genetic diversity of *Plasmodium* spp. in the study area should be embarked on so as to further build its database in Nigeria.

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