

## **Prevalence of gastrointestinal helminths of local chickens (*Gallus gallus domesticus* Linnaeus, 1758) in Modakeke, Ile-Ife, Osun state, Southwestern, Nigeria.**

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### **Abstract**

A cross-sectional survey was carried out to determine the prevalence of gastrointestinal helminthes of local chickens (*Gallus gallus domesticus*) in Modakeke, Osun State, Nigeria between January and December 2022. One hundred and twenty chickens were bought from different markets within Modakeke, dissected and the gastrointestinal tract examined for helminthes in the laboratory. 100(83.3%) of the chickens was infected with at least one type of gastrointestinal helminthes. Seven species of gastrointestinal helminths which comprises three nematode species: *Ascaridia galli* (63.3%), *Heterakis gallinarum* (33.3%), and *Capillaria* spp. (16.7%); and four cestode species: *Raillietina tetragona* (53.3%), *Raillietina echinobothridia* (46.7%), *Raillietina cesticillus* (20.0%), and *Choanotaenia infundibulum* (33.3%) were recovered from the examined chickens. *A. galli* and *R. tetragona* are the most prevalent nematode and cestodes recovered with the prevalence of 63.3% and 53.30% respectively. A significantly higher prevalence of infection was observed among male chickens (93.3%) and the growers (5-15wks) (91.12%). Four (3.3%) of the examined chicken had single infection while 24(20.00%) of them had mixed infections. The small intestine had the highest infestation of gastrointestinal helminthes. The study concluded that the prevalence rate of parasitic helminthes among the sampled chickens was very high and in order to improve their productivity and overall health, a greater attention should be paid to their management.

**Keywords:** Gastrointestinal, Local chickens, Prevalence, Helminths, Infection

### **Introduction**

According to Garrigus (2007), domestic chicken, (*Gallus gallus domesticus*) was reported as one of the most ubiquitous and widespread domestic animal species worldwide. In 2010, it was estimated that the total number of domestic chicken (*Gallus gallus domesticus*) in Africa was more than 1.6 billion (FAOSTAT, 2012). Due to the great nutritional value of their meat and eggs as well as other socioeconomic benefits, people keep chickens primarily as a source of food but less commonly as pets (Matur, 2002). The majority of rural residents and farmers in tropical and sub-tropical countries kept chickens mostly as a source of protein (Ajayi, 2010). Local chicken has become important source of affordable protein to the rural economy as they contribute over 90% of the internal supply of poultry meat in Nigeria (Ikeme, 1997; Frantovo, 2002; Jegede *et al.*, 2015). They are an integral part of a well-balanced farming system and provide families in rural and semi-urban regions with a vital source of animal protein (Mahendra *et al.*, 2016). In Nigeria, the edible products of the local chickens are preferred in rural and semi-urban households because of their pigmentation, taste, leanness, and suitability

for special dishes,(Obioha *et al.*, 1983; Horst, 1989; Dessie and Ogle, 2001); thus, they are of high social value and are considered to be an integral part of rural lifestyles (Dessie and Ogle, 2001, Mahendra *et al.*, 2016).

Free range management is one of the common methods of rearing chickens mostly in Africa (Perimin *et al.*, 1997). According to Fakae *et al.* (1991), the system permit little or no healthcare and supplementary feeding for the chickens. This method also allows chickens to forage around during the daytime thus they feed on kitchen waste, leftover cereals like rice, maize, guinea corn, millet, insects, and other available feed (Jegade *et al.*, 2015, Idika *et al.*, 2016). These eating habits and other factors unique to the method of rearing local chickens make them highly susceptible to parasitic infections (Jegade *et al.*, 2015).

Some of the reported significant groups of parasites usually found in the intestine and freshly discharged droppings of chickens are nematodes, cestodes, and trematodes (Fakae and Paul-Abiade, 2003; Dude *et al.*, 2010). Improvements in hygiene, housing and management procedures have significantly decreased the occurrence of parasitic infection in the commercial system of poultry production (Yoriyo *et al.*, 2008). However, several studies have revealed that parasitic infections among the free-range birds in Nigeria and some other African countries is still relatively high (Pandey *et al.*, 1992, Ayehe-Kumi *et al.*, 2016, Idika *et al.*, 2016).

Heavy parasitic infections have been reported to have devastating effects on growth, egg production, and overall health of local chicken (Idika *et al.*, 2016). Also, gastrointestinal helminthes can reduce immune system response to vaccination and increase disease vulnerability in local chickens (Pleidrup *et al.*, 2014). Moreover, these heavy infection rates put humans at risk of secondary infection if undercooked poultry meat and offals is consumed (Azanza and Gedaria, 1998)

Although series of studies had been carried out on gastrointestinal helminthes of chicken in Nigeria (Baba and Oveka, 2004; Uhwo *et al.*, 2013; Adang *et al.*, 2014, Junaidu *et al.*, 2014, Jegede *et al.*, 2015), the studies are not well distributed across geographic regions of the country and from the search in literature, no study of such has been conducted especially in Modakeke, Ife East Local Government Area of Osun State, thus the need for this study. The results from the study will not only provide a baseline information on this parasitic infection in the study area but also add to existing data on the prevalence of gastrointestinal parasites of local chickens in Nigeria and will also inform intervention decisions such as the implementation of an effective parasite control strategy in rural regions of Nigeria.

## **Materials and Methods**

### ***Study Area***

Modakeke is located in Ile –Ife within Ife East Local Government Area of Osun State. The study area lies between latitudes 7°27'N and 07°45'N and longitudes 4°32' and 4°39'E. The study area has a landmass of about 22.92 square kilometers with an elevation of 275 meters (Ayanlade and Orinmogunje, 2011). The study area is located in a tropical climate with averagely high temperatures, heavy seasonal rainfall, and high relative humidity (Sosan *et al.*, 2019). The majority of the inhabitants are government workers, business men and women, farmers, artisans and students. Preliminary survey revealed that some of the inhabitants are involved in the rearing of domestic animals such as chickens, goats, sheep, and dogs with approximately 80% free range method.

### **Collection of Samples**

A total of 120 local chickens comprising of 60 male and 60 female and of different age groups were bought between January and December, 2022. The birds were selected in batches (10 at a time) using a simple random technique from different open air markets within the study area, after which they were kept in a ventilated cage and taken to the Department of Zoology, Parasitology and Public health Unit Laboratory, Obafemi Awolowo University, Ile Ife, Osun, State, Nigeria. The sex, weight, age and other morphometric parameters were determined and recorded.

### **Sample Preparation and Collection of Parasites**

In the laboratory, the chickens were anaesthetized in a desiccator using chloroform. The chickens were dissected and the gastrointestinal tract of each chicken was opened up from the oesophagus to cloaca as described by Shukla and Mishra (2013). The gastrointestinal tract was separated into different sections and each section was placed in a well labelled Petri-dish containing 0.9% concentration of physiological saline. The cut sections were excised and examined thoroughly for helminthes. All helminthes visible to the unaided eyes were collected using a pair of forceps into a labeled Teflon tubes (according to the section of the gastrointestinal tract they were retrieved from) and preserved with 70% alcohol.

### **Preservation and Observation of Recovered Helminths**

The nematodes were washed in 0.9% physiological saline and preserved in 70% alcohol containing 2-3 drops of glycerine. However, platylhelminths were first placed in warm water at about 60°C for 5-10 minutes and fixed in Alcohol Formol-Acetic (AFA) for 15 minutes to one hour before they were preserved in 70% alcohol. The parasites were examined by placing the prepared sample on a glass slide, adding 2-3 drops of lactophenol and leaving it to clear for 10 minutes before being examined under the microscope. Individual parasites were identified using identification keys of Soulsby (1982) and Khalil *et al.* (1994)

### **Statistical Analysis**

All data were analyzed using IBM SPSS Statistics for Windows, Version 21.0. Differences in prevalence of infection were tested using chi-square, T-test, and One Way ANOVA. Statistical difference was assigned at  $P \leq 0.05$ .

## **Results**

A total of 100 (83.30%) local chickens out of 120 chickens examined from the study area harboured one or more gastrointestinal parasites in their gastrointestinal tracts. Seven different helminth parasites were isolated and identified from the gastrointestinal tracts of the infected chickens obtained in the study area. The parasites recovered consist of three (3) nematodes and four (4) cestodes. The nematodes are *Ascaridia galli*, *Heterakis gallinarum* and *Capillaria* spp. while the cestodes are *Raillietina tetragona*, *Raillietina echinobothridia*, *Raillietina cesticillus* and *Choanotaenia infundibulum*. The prevalence analyses revealed that a nematode *Ascaridia galli* had the highest prevalence (63.33%) which was closely followed by a cestode *Raillietina tetragona* (53.33%). A nematode *Capillaria* spp. had the least parasitic prevalence (16.66%) among the helminthes recovered from the examined chickens (Table 1). The order of prevalence of nematodes recovered from the chickens are *Ascaridia galli* followed by *Heterakis gallinarum* then *Capillaria* spp. while the cestodes have prevalence order of *Raillietina tetragona* > *Raillietina echinobothridia* > *Choanotaenia infundibulum* > *Raillietina cesticillus* (Table 1).

**Table 1:** Prevalence of gastrointestinal parasites in relation to sex of chickens in the study area

Recovered Helminthes	Sex of the chicken		
	Female(n=60) (% infected)	Male (n=60) (% infected)	Both sexes(n=120) (% infected)
<b>Nematodes</b>			
<i>Ascaridia galli</i>	26(43.33)	38(63.33)	64(53.33)
<i>Heterakis gallinarum</i>	15(25.00)	25(41.66)	40(33.33)
<i>Capillaria</i> spp.	12(20.00)	8(13.34)	20(16.66)
<b>Cestodes</b>			
<i>Raillietina tetragona</i>	36(60.00)	40(66.70)	76(63.33)
<i>Raillietina echinobothridia</i>	20(33.30)	36(60.00)	56(46.66)
<i>Raillietina cesticillus</i>	8(13.30)	16(26.70)	24(20.00)
<i>Choanotaenia infundibulum</i>	16(26.70)	24(40.00)	40(33.33)
<b>Total</b>	<b>44(73.30)</b>	<b>56(93.30)</b>	<b>100(83.30)</b>

A significantly ( $P<0.02$ ) higher infection rate of gastrointestinal parasites was observed among the male (93.33%) birds than their female (73.33%) counterparts as shown in Table 1. It was also observed that all the recovered helminthes with the exception of *Capillaria* spp. had gender preference which was significantly higher in the male chickens compared to the females as shown in Table 1. The prevalence of infection was assessed among the chicken in relation to their age group and the result of the study revealed a statistically ( $P<0.05$ ) higher rate of gastrointestinal helminthes among the age groups but the highest prevalence (91.12%) was recorded among the growers (5-15wks) than the adults(>16wks) chicken (Table 2)

**Table 2:** Prevalence of gastrointestinal helminthes in relation to the age groups of the chicken

Age group(wks)	No Examined	No (%)infected
5-15(grower)	45	41(91.12)
>16 (Adult)	75	59(78.67)
<b>Total</b>	<b>120</b>	<b>100(83.30%)</b>

As shown in Table 3, small intestine was the most infested region in the gastrointestinal tract of the examined chickens. However, all the examined regions of the gastrointestinal tract was infested with either a nematode or a cestode or both. It was observed that *Capillaria* spp. and *Raillietina cesticillus* did not infest both the caecum and the large intestine. However, among the recovered parasites in the gastrointestinal tract of the examined chickens, *Heterakis gallinarum* was the only parasites that does not infect the small intestine.

Mixed helminthes infection across the gastrointestinal tract was observed. *Ascaridia galli*, *Raillietina tetragona*, *Raillietina echinobothridia*, and *Choanotaenia infundibulum* were recovered in all sites of infection. *Heterakis gallinarum* was identified in the caecum and large intestine while *Capillaria* spp. and *Raillietina cesticillus* were recovered from the small intestine (Table 3).

**Table 3:** Prevalence of each helminth parasite recovered from the gastrointestinal tract of sampled chickens from Modakeke Ife

Recovered Helminthes	Site of infection			Total of number infected site	No (%) infected N=120
	Small intestine	Caecum	Large intestine		
<b><i>Nematodes</i></b>					
<i>Ascaridia galli</i>	+	+	+	3	76(63.33)
<i>Heterakis gallinarum</i>	-	+	+	2	40(33.33)
<i>Capillaria</i> spp.	+	-	-	1	20(16.66)
<b><i>Cestodes</i></b>					
<i>Raillietina tetragona</i>	+	+	+	3	64(53.33)
<i>Raillietina echinobothridia</i>	+	+	+	3	56(46.66)
<i>Raillietina cesticillus</i>	+	-	-	1	24(20.00)
<i>Choanotaenia infundibulum</i>	+	+	+	3	40(33.33)

## Discussion

The findings from this study is the first of its kind in the study area, though several studies have been carried out to examine the prevalence of gastrointestinal infections in local chickens across different locations in Nigeria (Junaidu *et al.*, 2014; Idika *et al.*, 2016; Afia *et al.*, 2019). The high overall prevalence of infection with gastrointestinal helminthes that were observed in this study confirmed the report of Adang *et al.* (2014) and Afia *et al.* (2019) that gastrointestinal helminthes in local chickens in Nigeria and other African countries may be close to 100%. Junaidu *et al.* (2014) reported similar findings of 81.5% in Kaduna State. However, the prevalence rate observed in this study was higher than 59.64% and 63.6% reported by Yehualashet (2011) and Ogbaje *et al.* (2012) in Ethiopia and Makurdi, Nigeria respectively. The differences in the prevalence could be attributed to differences in the geographical location, management system, seasonal differences, sample size (Jegade *et al.*, 2015; Ananda *et al.*, 2016) and research methodology adopted. These factors have been documented to predispose birds to infection in their environment by supporting egg and larval development, also facilitating transmission of helminth parasites (Ashenafi and Eshetu, 2004; Phiri *et al.*, 2007)

One of factors that may be responsible for the high prevalence rate of gastrointestinal helminthes recorded in this study include a favourable climatic condition which encourages the development of the helminthes which has been reported in rural and semi-urban centers (Baboolal *et al.*, 2012). Another factor that might be responsible for the high prevalence of gastrointestinal helminthes observed in this study may be associated with the free range management adopted in the study area. This method allows chickens to roam freely in search of food thereby feeding on insects and other soil dwelling invertebrates that might serve as the intermediate and paratenic hosts for most helminthes of poultry (Soulsby, 1982; Idika *et al.*, 2016)

The helminthes belonging to Class Nematoda and Cestoda that are recovered in this study have been previously reported in similar studies involving local chickens in tropical countries and elsewhere (Ashenafi and Eshetu, 2004; Shukla and Mishra, 2013; Ananda *et al.*, 2016; Idika *et al.*, 2016; Maina *et al.*, 2017). In this study, nematodes are found to be most prevalent followed by cestodes and this is similar to the reports of Katoch *et al.* (2012) in Jammu, but in contrast to the reports of some researchers (Puttalakshamma *et al.*, 2008, Adang *et al.*, 2014,

Junaidu *et al.*, 2014 and Abah *et al.*, 2019) who reported a higher prevalence in cestodes especially *Raillietina* spp. than nematodes in their studies. The reason for this could be attributed to the scavenging habit of local chickens, which involves searching for food in places like soil, drains, dumpsite etc. This behaviour could expose them to parasitic organisms thus allowing individual birds to contact one or more forms of gastrointestinal parasites (Phiri *et al.*, 2007; Idika *et al.*, 2016; Ayeh-Kumi *et al.*, 2016).

A nematode, *Ascaridia galli* had the highest prevalent rate among other helminthes that was recovered in this study. The result of this study is similar to reports of Junaidu *et al.* (2014) in Kaduna State, Idita *et al.* (2016) in Usukka, and Shukla and Mishra, (2013) in Madhya Pradesh, India, who reported higher prevalence of *Ascaridia galli* among other gastrointestinal helminthes recovered in their studies. To corroborate the findings of this study, *Ascaridia galli* has been reported in several studies in Nigeria (Matur *et al.*, 2010; Jegede *et al.*, 2015; Afia *et al.*, 2019) and elsewhere (Jordan and Pattison, 1996, Shukla and Mishra, 2013) as the commonest and important helminthes of poultry.

The most common cestode in this study was *Raillietina tetragona* which was followed by *Raillietina echinobothridia* and *Raillietina cesticillus*. This agrees with observation made by Puttalakshamma *et al.* (2008) and Ananda *et al.* (2016) in Bangalore and Shimoga India respectively but contradicts Katoch *et al.* (2012) who reported otherwise.

A significantly higher prevalence of 93.3% was recorded in male local chickens when compared with their female counterparts (73.3%). However, the result contradict the findings of Matur *et al.* (2010) and Shukla and Mishra, (2013) who recorded rather higher infection rate in female chickens. The reason for higher infection recorded among male birds in this study could be due to the fact that male birds continuously expand their foraging territory in quest of food and mate during the mating season, thereby increasing their risk of contracting parasitic infections unlike the female chickens according to Adang *et al.* (2014), who tend to narrow their foraging territory during the breeding season, thus lowering their risk of contracting gastrointestinal parasites.

This study showed that there was a significant difference in the helminthes prevalence among the age groups with the highest prevalence occurring in growers birds (92.12%). This implies that the gastrointestinal helminthes infection was influenced by age. This existing immunity that the adults chicken had acquired over the years from exposure to gastrointestinal helminthes from the environment could be the reason for low prevalence of helminthes recorded in this group of chickens examined

Small intestine was the most infected site out of the three sites where intestinal helminthes are recovered from. This makes the small intestine the predilection site in the study and this is in accordance with the findings of Adang *et al.* (2014), Junaidu *et al.* (2014) and Abah *et al.* (2019). The small intestine is known to house digested food and debris and this may account for why most of the gastrointestinal helminthes are found there. However, *Heterakis gallinarum* was an exception as there was no record of its infection in the small intestine but the parasite recorded a prevalence of 40.0% in the caecum. This result is not far-fetched as *Heterakis gallinarum* is known to be a caecal helminthes as previously reported by Maina *et al.* (2017)

The study further revealed that out of the 100 (83.30%) local chickens infected, only 4 (3.3%) had single infection. 24 (20.00%) had double infections and 72 (60.00%) had multiple

infections. This is in line with the studies of Adang *et al.* (2014) and Abah *et al.* (2019). The high prevalence of multiple infections in this study may be due to frequent exposure to intermediate hosts for each parasitic helminthes recovered.

## **Conclusion**

According to the findings of this study, local chicken in Modakeke, Ife East Local Government Area of Osun State have a high prevalence rate of gastrointestinal helminthes. Therefore, effective preventive and control methods of helminthic infections which include mass deworming and sensitization of farmers on modern techniques and practices need to be taken seriously

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