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Prevalence of Gastro-Intestinal Parasites in Chickens Sold in Some Major Markets in Greater Accra, Ghana

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Abstract: Gastrointestinal parasitic infections in chicken production industry are known to be one of the factors responsible for the high mortality rate in poultry farming in Africa. This study aimed to determine the prevalence of gastrointestinal parasites in chickens sold in major markets in Accra, Ghana. A cross-sectional study was carried out with 152 alimentary tracts of chicken randomly collected from the chicken dressing units from major markets (Achimota, Agbogboloshie, Nungua, Kaneshie and Dansoman markets) in Accra, Ghana. The samples were examined for gastrointestinal parasites by examination of fecal samples of birds, collection of parasites from different part of gastrointestinal tract and examination of the collected parasites by standard parasitological techniques followed by morphological identification as far as possible up to the species level. Out of 152 chickens examined from the five markets, 121(79.9%) chickens were found to be infected with gastrointestinal parasites. The chickens were found to be commonly infected with *Capillaria* spp (46.1%), *Heterakis gallinarum* (39.5%) and *Ascaridia galli* (36.9%). Out of the 121 chickens examined, 63.63% had mixed infection. No trematodes were encountered in this present study. The different market locations did not have any significant influence on the prevalence of the different gastrointestinal parasites detected. However, chickens from Nungua market were found to have the highest level (90%) of gastrointestinal parasite, whilst Kaneshie market (67.5%) had the least. Present study revealed that mixed infection with gastrointestinal parasites of different species was more common than infection with single species in chickens in Accra.

Key words: Gastrointestinal parasites, chickens, Ghana

INTRODUCTION

In many African countries, chicken production is reported to generate over US$ 5.75 billion annually (FAO, 2010). Unfortunately, the chicken production industry is constrained by poor management practices, malnutrition and inadequate biosecurity in most developing countries (Nnadi and George, 2009). Whilst, disease causing agents involving viruses, bacteria and parasites have been linked to increase mortality in chicken production (FAO, 2010), gastrointestinal parasites are the most prevalent and devastating diseases affecting chicken productivity in most developing countries (Poulsen *et al*., 2003). Nematodes, cestodes, trematodes and coccidian are the major gastrointestinal parasites associated with poultry (McDougald, 2011). Parasites have been found to cause decrease in appetite and weight, drooping wings, decreased egg production, anaemia, diarrhoea as well as deaths in chickens (Anna, 2006; Irungu *et al*., 2004; Kaufman *et al*., 2007). In addition, beetles and houseflies inhabiting poultry houses act as intermediate host for most species of these parasites (Baba and Oveka, 2004). Furthermore, Chickens feeds on a wide range of food substances (grains, fruits and insects) which may harbour infective stages of parasites and thereby predisposing them to gastrointestinal parasites (Yoriyo *et al*., 2008; Hotez *et al*., 2008). This can inturn affect the quality of human nutrition and the revenue being generated from poultry production. Furthermore, the parasites can be a potential epizoonosis for other animals as well as humans when they come into contact with faeces contaminated with the infective eggs of the parasites (FAO, 2010).

There have been various studies to determine the prevalence of gastrointestinal parasites in chickens. In Trinidad and Tobago, Vandanaa *et al*. (2012) reported a 10.5% prevalence of gastrointestinal parasites in broiler chickens. In Iran, Eslami *et al*. (2009) reported 96% prevalence of gastrointestinal parasites among chickens. Although a similar study by Yagoob and Mohsen (2014) reported a lower prevalence (63%) in another city in Iran. Whilst a study in India have reported a 58.75% prevalence of gastrointestinal helminths (Hembram *et al*., 2015), in Bangladesh, Alam *et al*. (2014) reported 91.8% prevalence

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in some indigenous chickens. In Ethiopia, Heyradin *et al*., (2012) reported 89.5% prevalence in some scavenging chickens. Although a previous study by Ashenafi and Eshetu (2004) reported 90.21% gastrointestinal parasites in some local chickens in Central Ethiopia. In Kenya, Irungu *et al*. (2004) reported a 90.78% prevalence of intestinal parasites in some poultry, whilst Mungube *et al*. (2008) had 93.3% in some scavenging birds in Kenya. However, In Zimbabwe, Dube *et al*. (2010) reported 100% prevalence in scavenging chickens and in Zambia, Phiri *et al*. (2007) reported 95.2% among indigenous chickens in some selected villages. In Nigeria, Nnadi and George (2010) reported 71.3% prevalence in selected villages in South-Eastern Nigeria. Similarly, Junaidu *et al*. (2014) have reported 81.5% prevalence in some domestic slaughtered chickens. In Ghana, *Gallus gallus domesticus* is the most reared specie of chicken (FAO, 2010). Although a previous study in Ghana by Poulsen *et al*. (2000) reported a 100% prevalence of gastrointestinal and haemo parasites in young scavenging chickens in the Eastern Region, there is currently limited information on the prevalence of gastrointestinal on the Southern part of Ghana. Therefore, this study aimed to determining the prevalence of gastrointestinal parasites in chickens slaughter in some major markets in Accra, Ghana.

MATERIALS AND METHODS

Sample collection and sample size: One hundred and fifty two chickens were tested randomly form chicken dressing units from major markets (Achimota, Agbogbloshie, Dansoman, Kaneshie and Nungua markets) in Accra from April, 2015-July, 2015. These markets were selected because they have a high turnout activity on market days and during festive seasons in Accra. A minimum of twenty samples each was collected from each market and inspected thoroughly for the crop, proventriculus, duodenum, small intestines, caeca and cloaca before being placed in a container half full of 10% formalin. The samples were transported in an ice chest within one hour to the laboratory for analysis.

Laboratory analyses

Identification of adult worms: In the laboratory, the alimentary tracts were opened from the oesophagus down to the rectum using sterile scissors. The various organs were dissected and the worms visible to the naked eye were collected using a pair of forceps into a petri dish containing physiological saline. The worms retrieved were then stored in 10% formalin solution until their identification processes were carried out. All adult worms, helminth eggs and coccidian oocysts were identified using identification keys of Soulsby (1982).

Identification of helminth eggs and coccidian oocysts: Intestinal contents from the upper, middle and lower linings of the intestines as well as the caecum were placed in containers and labelled for each alimentary tract dissected. The intestinal content was used for the detection of helminth eggs and coccidian oocysts using the sedimentation method and the floatation method.

Sedimentation method: Formol ether concentration technique (Ridley's modified method) was used to sediment the parasites. Approximately 3 g of the intestinal content was placed in a clean test tube and 8 ml of 10% formol-saline solution was added. The test tube containing the solution was stoppered using a lid and the test tube was inverted vigorously many times for 1 min to obtain a faecal suspension. The faecal suspension was then filtered into a clean glass tube using a single layer of cotton gauze. Ether solution (4 ml) was then added to the filtered suspension and mixed for 1 min before being centrifuged at 3000 g for 5 min. The supernatant was gently discarded and a drop of the sediment was placed on a clean glass slide and examined under the microscope using the x 10 and x 40 magnification to detect and identify helminth eggs.

Floatation method: This method was carried out using the saturated NaCl salt solution. The floatation fluid had a specific gravity of 1.20 which is higher than most helminth eggs and coccidian oocysts therefore the eggs and oocysts floated and accumulate in the surface layer. This made it easier for the eggs and oocysts to be harvested. Approximately 3 g of the intestinal content was placed in a clean container and 50 ml of the floatation fluid was added. The solution was thoroughly mixed and the suspension was sieved through layers of cotton gauze into another clean container. The solution was left undisturbed on a leveled table for 10-15 mins to allow the eggs and oocysts to float and accumulate in the surface layer whilst the other particles with higher specific gravity was allowed to sink. A clean glass slide was then placed on top of the container and was carefully removed after 10 mins. The glass slide was immediately cover slipped and observed under the microscope using x10 and x40 magnification to detect and identify helminth eggs and coccidian oocysts.

Data analysis: Data was analyzed using the SPSS version 20 package. Prevalence was calculated and expressed as a percentage of n/N where n is the number of chickens infected and N is the total number of chickens examined. A non-parametric test (Kruskal Wallis test) was used to compare mean of infection from the four markets with degree of freedom of 4. The association between the independent factors (the markets) and the prevalence of the various parasites were evaluated using the Chi-square test (x2). In all the analysis, confidence level was held at 95% and P of $\leq$0.05 was considered significance.

RESULTS

Prevalence of gastrointestinal parasites in chickens in Accra: Five major markets in the greater Accra region of Ghana were surveyed in this study for gastrointestinal

Table 1: Prevalence of parasites across the five study markets, n = 152

Market Location	No. of Tested chickens	No. of Parasites Identified (%)					
		Ascaridia galli	*Heterakis gallinarum*	*Capillaria* spp.	*Raillietina* spp.	*Choantaenia infundibulum*	*Eimeria* spp.
Agbogbloshie	52	29 (55.7)	12 (23.1)	27 (51.9)	19 (36.5)	0	5 (9.6)
Achimota	20	7 (35.0)	12 (60.0)	8 (40.0)	3 (15.0)	0	2 (10.0)
Dansoman	20	9 (35.0)	15 (75.0)	10 (50.0)	9 (45.0)	1(5.0)	7 (35.0)
Kaneshie	40	4 (10.0)	11 (27.5)	15 (37.5)	7 (17.5)	0	4 (10.0)
Nungua	20	7 (35.0)	10 (50.0)	10 (50.0)	3 (15.0)	0	7 (35.0)
Total	152	56	60	70	41	1	25

parasites of chicken. A total of 152 chickens was examined and out of the chickens examined, 121 chickens were found to be infected with one or more gastrointestinal parasites (79.6%) (Table 1). Out of the 121 chickens infected 57.9% were infected with *Capillaria* spp, this was followed by *Heterakis gallinarum* (49.6%), *Ascaridia galli* (46.3%), *Raillietina* spp (33.9%), *Eimeria* spp (20.7) and *Choataenia infundibulum* (0.7%) (Table 1).

Prevalence of gastrointestinal parasitic infections in chickens sampled from different markets: In Agbogbloshie market, out of a total of 52 chickens sampled 44 (84.6%) were found to be infected with gastrointestinal parasites (Table 1). *Ascaridia galli* (55.8%), *Capillaria* spp. (51.9%), *Raillietina* spp. (36.5%) and *Heterakis gallinarum* (23.1%) were the common parasites identified. A total of 20 chickens were sampled from Achimota market and 15(85%) were found to be infected with gastrointestinal parasites. *Heterakis gallinarum* (60%), *Capillaria* spp. (40%), *Ascaridia galli* (35%), *Raillietina* spp. (15%) and *Eimeria* spp (10%) were the detected parasites. In Dansoman market 17(85%) chickens were found to be infected with gastrointestinal parasites. *Heterakis gallinarum* (55%), *Capillaria* spp. (50%), *Raillietina* spp. (45%) and *Ascaridia galli* (45%) and *Eimeria* spp (9.6%) were the parasite detected. A total of 40 chickens were sampled from Kaneshie market and 27 (67.5%) were found to be infected. *H. gallinarum* (37.5%) and *Capillaria* spp. 37.5%, *Eimeria* spp. (25%) *Raillietina* spp. (17.5%) and *A. galli* (10%) were the detected gastrointestinal parasite.

Nungua market had an overall prevalence of 90% as 18 out of the 20 chickens sampled were found to be infected with gastrointestinal parasites. The parasites detected were *Capillaria* spp. (50%) and *H. gallinarum* (50%), *Ascaridia galli* (45%), *Raillietina* spp (45.5%) and *Eimeria* spp. (15%).

In contrast to Kaneshie market where *Capillaria* spp. were found to be the common single infection, *A. galli* was the common single infections in Agbogbloshie market (Fig. 1). In the Dansoman, Kaneshie and Nungua markets infection with *Heterakis gallinarum* and *Capillaria* spp. were the common mixed infections in the tested chickens.

In total, the highest prevalence of chicken infected with gastrointestinal parasites was at Nungua market (90%) and the least prevalence was at Kaneshie (67.5%). Although one chicken sample from Dansoman market was infected with *C. infundibulum* (5%), none of the chickens from the other markets was found to be infected with *C. infundibulum*. There was no significant relationship between the different markets and the prevalence of the various gastrointestinal parasites detected ($X^2 = 9.06$, $p = 0.69$). The pictures of some of the detected parasites in this study can be found in Fig. 2-9.

DISCUSSION

This study revealed a wide range of gastrointestinal parasitic infections among chickens in Accra, Ghana.

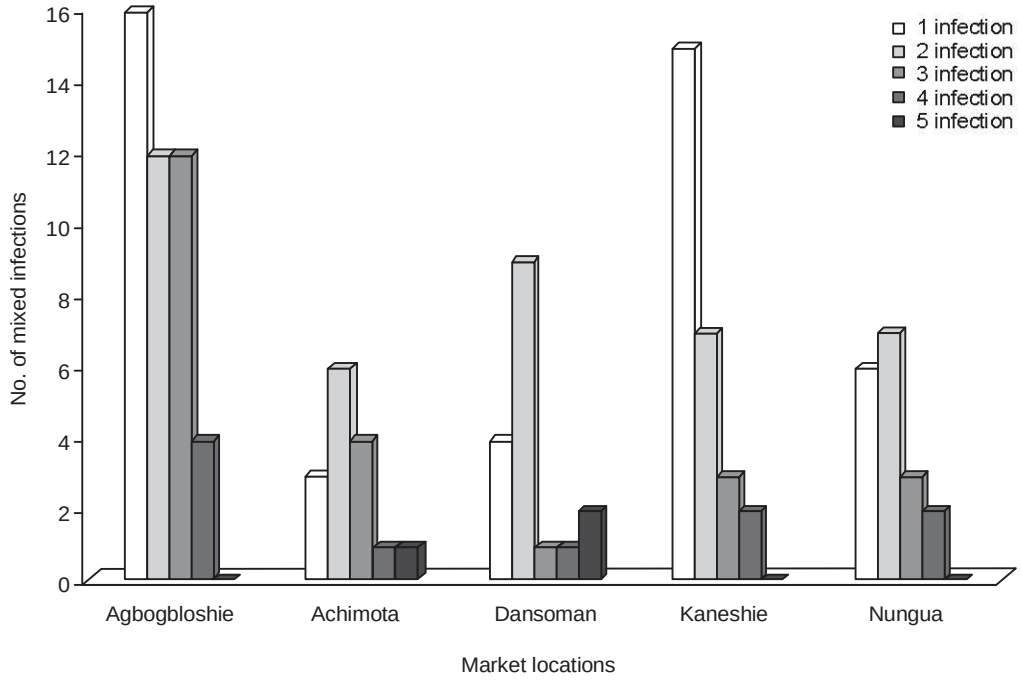

Fig. 1: Prevalence of parasitic mixed infections in the sampled major Market in Accra, Ghana

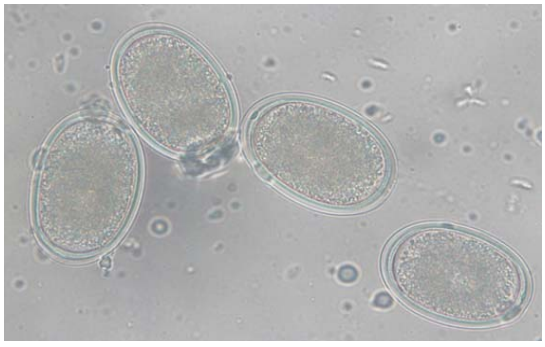

Fig. 2: Ova of *Ascaridia galli*

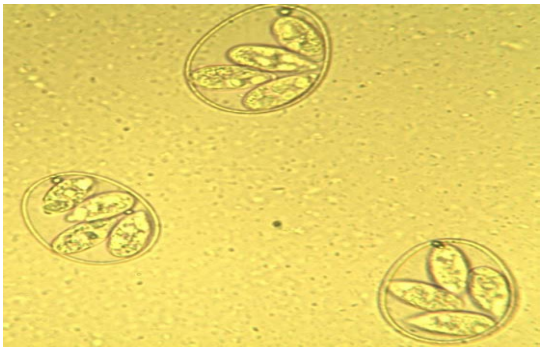

Fig. 3: Oocysts of *Eimeria* spp

Overall, 79.6% (121/152) of the tested chickens were infected with one or more of the gastrointestinal parasites (helminthes or protozoan). Out of 121 chickens infected, 77 had mixed infections (63.6%). The results obtained from this study are in line with studies reported by Nnadi and George (2010), Junaidu *et al.* (2014) and Sonune (2012) which reported 71.3, 81.5 and 72% prevalences in scavenging chickens in Kenya, Ethiopia and India respectively. Although this study findings are higher than those reported by Luka and Ndams (2007), Yagoob and Mohsen (2014) and Vandanaa *et al.* (2012) in Nigeria, Iran and Trinidad with 62, 63 and 10.5% respectively, it is lower than those reported by Heyradin *et al.* (2012), Irungu *et al.* (2004) and Phiri *et al.* (2007) which reported a 89.5%, 90.78% and 95.2% prevalence, respectively. The difference in prevalences could be related to the differences in the management systems, study method, sample size and control practices in the different countries. The prevalence of gastrointestinal parasitic infection in the various markets was found to vary at Nungua market (90%), Dansoman (85%), Agbogbloshie (84.6%), Achimota (75%) and Kaneshie (67.5%). This study revealed that the various markets had no significant influence on the prevalence of the gastrointestinal parasites. The high prevalence of gastrointestinal parasites recorded at these markets may be as a result of constant contact with infective stages of the gastrointestinal parasites and intermediate host of these parasites (Ashenafi and Eshetu, 2004). This may be due to the poor waste management, scarcity of feed and poor drainage systems observed at some of the studied sites (especially at Agbogbloshie and Nungua). Lack of good

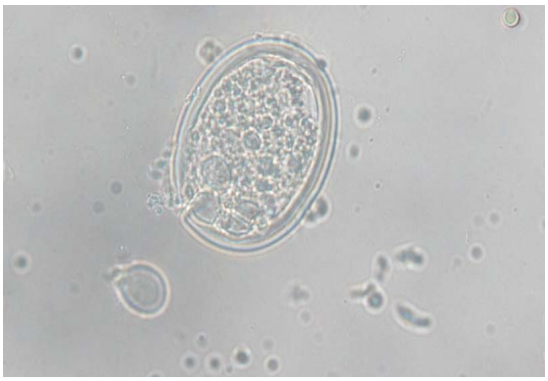

Fig. 4: Ova of *Raillietina* spp

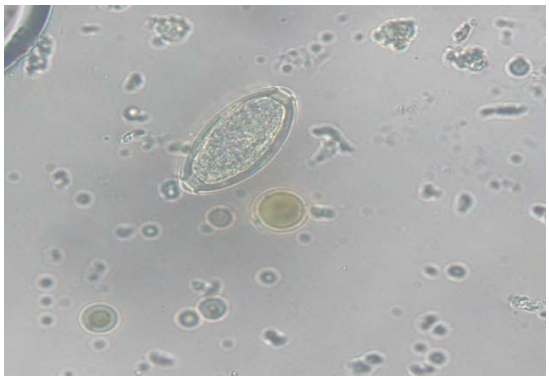

Fig. 6: Ova of *Capillaria* spp

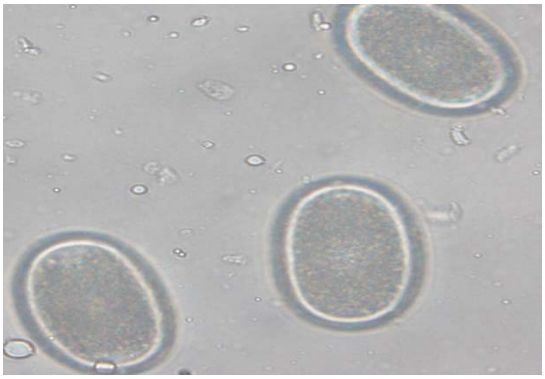

Fig. 5: Ova of *Heterakis gallinarum*

Fig. 7: Ova of *Choantaenia infundibulum*

drainage systems can lead to the production of stagnant water in gutters and pot-holes around the various chicken dressing units. These stagnant water and deposits from drainage can carry oocysts, ova of coccidian and helminthes (Offiong *et al*., 2013). In addition, in the absence of feed, chickens may be forced to eat different insects, snails, beetles and earthworms that may be intermediate hosts of some nematodes and cestodes (Baba and Oveka, 2004). Furthermore, the housing conditions for the chickens might have contributed to the high prevalence of infection as many of the birds were housed in overcrowded small cages. Overcrowding enables parasitic transmission from one chicken to the other (Bekali *et al*., 2009).

The nematodes detected in this study are *Capillaria* spp. (46.1%), *Heterakis gallinarum* (39.5%) and *Ascaridia galli* (36.9%). These nematodes have a direct life cycle hence enhancing their mode of transmission as compared to cestodes and trematodes (McDougald, 2011). The high prevalence of nematode infections over that of cestode infections in chickens is in agreement to studies carried out in Algeria (73.6%), Ethiopia (47.5%), Zimbabwe (93.9%) and India (34.3%) (Hassouni and Belghyti, 2006; Heyradin *et al*., 2012; Dube *et al*., 2010; Sonune, 2012). However it is in contrast to Ashenafi and Eshetu (2004) study with backyard chickens in central Ethiopia, which reported a high prevalence of cestodes (86.32%) compared to nematodes (75.79%).

Capillaria spp. (46.1%) was the common nematode detected in this present study. This result was found to be higher than reports from Ethiopia (1.53%) by Ashenafi and Eshetu (2004) and in Southern Eastern Nigeria (16.1%) by Nnadi and George (2010). This discrepancy could be due to individual host resistance and variation in seasonal conditions in the different countries (Mwale and Masika, 2011). *Heterakis gallinarum* (39.5%) was the second most prevalent nematode encountered in this study. Findings are similar to Ashenafi and Eshetu (2004) and Heyradin *et al*. (2012) studies which reported 32.6% and 37.9% prevalence in Ethiopia. It is however higher than 22.8% reported in Kenya (Mungube *et al*., 2008). *Capillaria* spp. and *Heterakis gallinarum* can be highly pathogenic for chickens kept under the traditional extensive systems (McDougald, 2011). Heavy infection with this parasite can make the chickens become emaciated, anaemic and this can lead to stunted growth, bloody diarrhoea and increase in mortality rate (Anna, 2006; Permin *et al*., 2002).

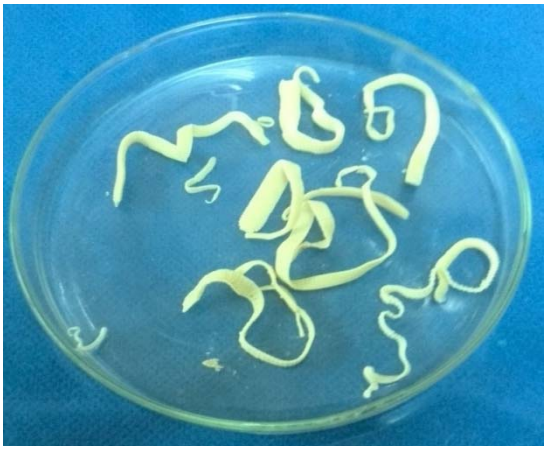

Fig. 8: Adult *Raillietina* spp. worm

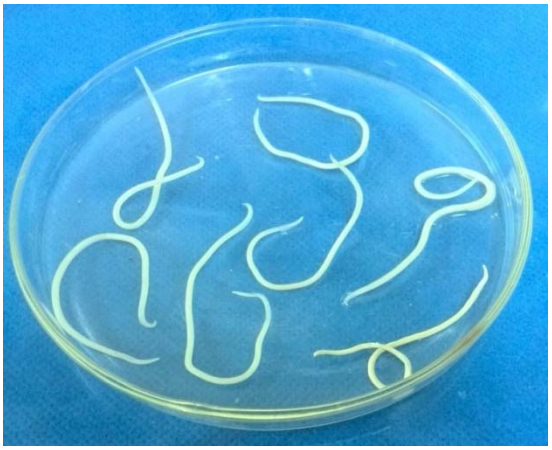

Fig. 9: Adult *Ascaridia galli* worm

Cestode infections in chickens are known to cause retarded growth, enteritis, diarrhoea and haemorrhages in young chickens (Ashenafi and Eshetu, 2004; McDougald, 2011). The cestodes encountered in this study were *Raillietina* spp (27%) and *Choantaenia infundibulum* (0.7%). The result obtained in this study is in conformity to a study in Ethiopia (25%) by Eshetu *et al.* (2001). However the results are lower than Poulsen *et al.* (2000) which reported a 81% prevalence in the Upper East Region of Ghana. These differences in prevalences could be attributed to variations in seasonal conditions and the easy accessibility of intermediate hosts (dung beetles, ants) to chickens (Oniye *et al.*, 2010).

The coccidian parasite *Eimeria* spp. registered the fourth highest prevalence of infection (16.4%). The result is similar to the study reported by Dube *et al.* (2010) for *Eimeria* spp. (20.57%) in Zimbabwe, However, these results from this study are lower compared to Sharma *et al.* (2013) which reported a prevalence of 53.61% in India.

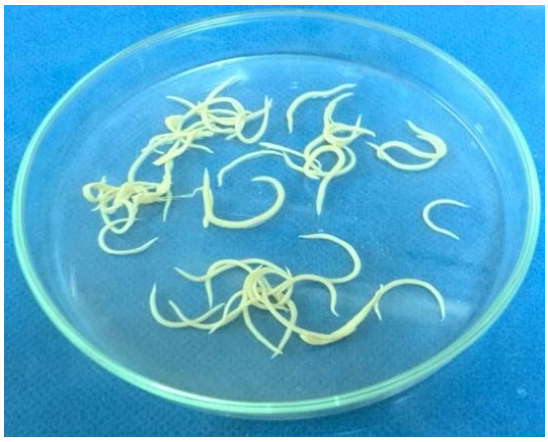

Fig. 10: Adult *Heterakis gallinarum*

Furthermore, this study found no trematodes in the tested chickens in any of the markets, findings in this study are in conformity with Luka and Ndams (2007) study in Nigeria. Chicken trematodes require the presence of freshwater and snails or dragonflies in their life cycles (Permin and Hansen, 1998). The lack of lakes and freshwater in the studied areas may have contributed to the absence of trematodes in the tested chickens in greater Accra region of Ghana.

Conclusion: This study revealed nematodes, cestodes and coccidia are prevalent in chickens in greater Accra region of Ghana. This study also revealed that the individual markets had no significant influence on the prevalence of gastrointestinal parasite. The high prevalence of gastrointestinal helminthes observed in these markets have a strong relationship with their mode of feeding and living conditions of the birds. In spite of minimal health care and improper sanitation practices adopted by some poultry farmers rearing chickens in some of the analysed markets in Accra, there is a need for continuous education on appropriate and preventive method for controlling gastrointestinal parasites in chickens. This will help prevent infection from gastrointestinal parasites from affecting the quality and nutritional contents of chickens being sold in Accra.

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