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The Prevalence of Gastrointestinal Helminthes of Free Range Backyard Chicken (Gallus Gallus Domesticus) In Digalu Andtijo District, in Arsi Zone, Oromiya Region

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Abstract
A study was conducted to estimate the prevalence of gastrointestinal helminthesof free range backyard chicken (*Gallus gallus domesticus*) in Digalu andTijo District, in Arsi zone, Oromiya region. For this purpose of this study a total of 384, of which 340 (232 males and 112 females) chickens' feces were sampled and subjected to coprological examination.In addition, 40(32males and 8 females) chickens were subjected to postmortem examination from December 2015 to April 2016. A simple salt floatation method was employed for fecal examination but postmortem examination was conducted by dissecting the GIT of chickens. The overall coproscopic examination prevalence and postmortem examination of chickens reared revealed prevalence of 72.4%, and82.5% respectively. During the investigation the main species of helminthes identified were *Ascaridiagalli* (38.37%), *Heterakis gallinarmn* (33.43%), *Raillietina echinobothrida* (13.8%), *Raillietina tetragona* (10.75%), Capillaria Species (10.17%),*Syngamus trachea* (8.13%) *Davainea proglottina* (7.55%), *Raillietina cesticillus* (6.25%), *Choanotaenia infundibulum* (5.46%) and *Amoebotaenia cuneata*(1.7%). The study revealed that there was high prevalence of intestinal parasites of domestic chicken in the study area. For reduction of the prevalence of the parasite there is a need to improve the management and disease control strategy of poultry to enhance their production and productivity.
Keywords: Chicken, Digalu and Tijo District, Free range, GIT helminthes, prevalence

1. INTRODUCTION

Poultry production is an important means of providing high quality of protein for human consumption. The population of the poultry in the world in 2013 was estimated to be 20.88 billion of which 4.7 million were found in African continent (FAOSTAT, 2013) while that of Ethiopia is estimated to be about 50.38 million (CSA, 2013). About 80% of poultry population in Africa and Asia are kept under free range system [Balay*etal*., 2011]. From the total population of chicken in Ethiopia, 99% are raised under the traditional back yard management system (Belihu*etal*., 2010; Tadelle*et al*., 2003).

However, the traditional poultry production system is characterized by low input, low output and periodic destruction of a large portion of the flock due to disease causing agents such as viruses, bacteria and parasites (Sayyed*et al*., 2000). Although parasitic diseases are among the major factors that decrease productivity of chickens, they are often neglected as they are most times subclinical. Parasitism is one of the major problems which inflict heavy economic losses to poultry production in the form of retarded growth, reduced weight gain, decrease egg production, diarrhea, intestinal obstruction and poor feathers. Stress from parasites could affect the blood picture and cause anorexia (Dube*et al*., 2010).

Therefore helmnthiosis was considered to be an important problem of local chickens and they are commonly divided into three main groups; nematodes, cestodes and trematodes. Nematodes constitute the most important group of helminthes parasites of poultry both in number of species and the extent of damage they cause; the main genera include Capillaria, Heterakis, and Ascaridia. The cestodes of significant importance are of the two genera Railleitina and Hymenolepsis (Matur*et al.,* 2010).

The prevalence and intensity of these helminthes infections may be influenced by several factors, including those that pertain to the host such as age, sex and breed (Jegede*et al*., 2015).

The domestic chicken feed on a wide range of food substances ranging from grains, fruits to insects which may harbor infective stages of parasites thereby predisposing them to parasitic infection, particularly gastrointestinal parasites (Frantovo, 2002; Tadelle*et al*., 2003). These parasites are common in the areas where the standard of husbandry is poor and reduce productivityof rural poultry (Abebe*et al*., 1997). In Ethiopia, a few studies have been carried out with regard to the prevalence of gastrointestinal parasites in different areas (Hagos,2000; Helina, 2000). However, these studies were limited to prevalence study of GIT helminthes of free range chickens in few areas near to town. But in the current study area there is scarcity of data on the prevalence of the internal parasites in free ranging chickens though, chicken are main source of income for the rural community. Hence, the present study is designed with the objective of identifying different species of gastrointestinal (GI) helminthes affecting free ranging or local backyard chicken in Digalu and Tijodisrict.

2. MATERIAL AND METHODS

2.1. Study Area

The study was conducted in Digalu and Tijo District which is located at 181 km south of Addis Ababa. Digalu and Tijoistheworeda in the Oromia Region of Ethiopia andlocated in central part of Arsi and the main road from Addis Ababa to Bale crosses the District. The District is bordered on the south by Lemu Bilbilo,on the southwest by Munesa, on the northwest by Tiyo, on the north by Hitosa, on the northeast by Tena, and on the east by Sherka. The District has a diverse agro-ecology suitable for the production of different crops and livestock. The annual rainfall ranges between 1000-1500mm.The altitude of this District ranges from 2500 to 3560 meters above sea level(Dwi*et al*., 2002).

2.2. Study Animals

The study population comprisedof rural free ranging chickens (Gallus gallusdomesticus) inDigalu and Tijo District owned by smallholder farmers. The chickens are let free during the daytime to scavenge and spend the night at home together with the family. The study chickens wereselected by Stratified Random Sampling technique from both sexes and all chicken above one month of age for coproscopic examination. The chickens were grouped into two age groups: from one month of age to start of breeding as young and after start of breeding considered as adult. In addition, 40 chickens slaughtered in various households during the Christmas wereselected for postmortem examination.

2.3. Sample Size and Sample Collection

The sample size is calculated using 50% estimated prevalence of the helminthes, as there is no previous report on the prevalence of the helminthes of chicken in the District, using desired 95% of confidence intervals and 5% precision according to Thrusfield, (2005). Accordingly three hundred eight four chicken were examined using fecal samples collected per cloacae of chicken or with a spatula from freshly voided feces and post-mortem examination of GIT of the free range chicken. Fecal samples were put into properly labeled universal bottles indicating the ages and sex of the chicken with 10% formalin as a preservatives and was transported to Asella Regional veterinary parasitology laboratory for processing. Identification of the helminthes eggs was carried out using the imported procedures stated by (Soulsby, 1982).

Postmortem Examination

The viscera weredetached from the mesentery and the GI tracts of 40 chickens were separated into smaller pieces. The esophagus with crop, gizzard with proventriculus, and caeca with the rest of the intestine were kept in three separate containers. Each piece was identified and incised longitudinally. The worms were collected from the different intestinal pieces by washing with tap water in separate trays and placed in different beakers containing 10% formalin. The parasites were examined under stereomicroscope. The identification of GI helmintheswas carried out by using their characters (Soulsby, 1982).

2.4. Data Management and Analysis

The information obtained from laboratory test and post mortem examination was entered on the spreadsheet of Microsoft excel work sheet. Descriptive statistics using SPSS version 20 was used to analyze the data but to see the association among the risk factors with the occurrence of the diseases Chi-square (x^2) test was used. Overall prevalence was calculated by dividing the number of positive animals by the total number of animals examined and multiplied by 100. A statistically significant association between variables was considered to exist if the calculated p-value is less than 0.05.

3. RESULTS

3.1. Coproscopic Examination

The result of the fecal analyses of the 344 chickens examined for GIT helminthes' eggs revealed that about 249 (72.4%) chickens were positive.Out of total infected chickens 39.0% were infected with nematodes, while 26.7% were found positive for cestode infections. Mixed infections accounted for 43.31% cases, while 29.06% chickens had single infection. Four species of nematodes and six species of cestodes were recorded during the present study (Table 1 &2).

Table 1: Coproscopic prevalence of gastrointestinal helminthes of scavenging chicken based on their age and sex.

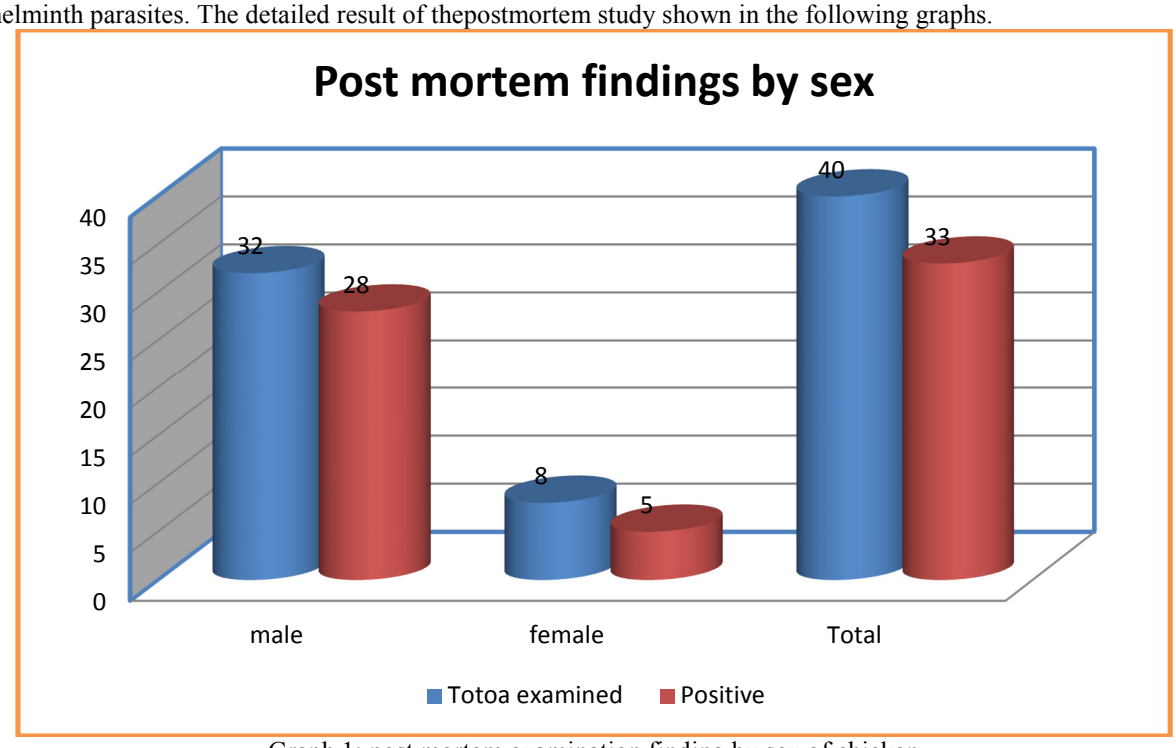
Variables			Nametode		Cestode	
		Number examined	Number positive	P- value	Number positive	P-value
Age groups	Young	133	59 (17.2%)	0.102	39 (11.3%)	0.301
	Adult	211	75 (21.8%)		53 (15.4%)	
Sex	Male	232	85 (24.7%)	0.20	55 (16.0%)	0.153
	Female	112	49 914.2%)		37 (10.8%)	

Table 2: Prevalence of different GIT helminthes infections in free-range backyard chickens.

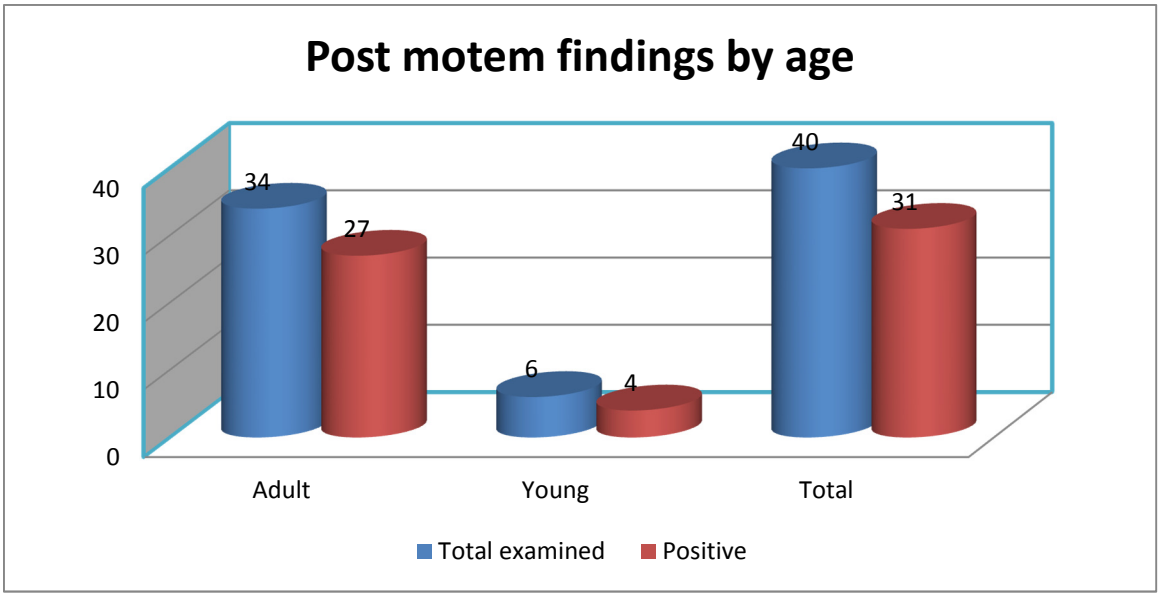
Species of parasites	Prevalence
Nematodes	
Ascaridia galli	38.37%
Heterakis gallinarum	33.43%
Syngamus trachea	10.17%
Capillaria spp	8.13%
Cestodes	
R. tetragona	10.75%
R. cesticillus	6.25%
R. echinobothrida,	13.18%
Choanotaenia infundibulum	5.46%
Amoebotaenia cuneate	1.7%
Davainea proglottina	7.55%

3.2. Postmortem Findings

From a total of 40 chickens examined by postmortem 33(82.5%) were infested with one or more types of adult helminth parasites. The detailed result of thepostmortem study shown in the following graphs.



Graph 1: post mortem examination finding by sex of chicken



Graph 2: post mortem examination finding by age of chicken

4. DISCUSSION

Gastro-intestinal helminthes are important constraints to poultry production sector by causing retarded growth, reduced weight gain, decrease egg production, diarrhea, intestinal obstruction and poor feathers. The present study revealed an overall prevalence of helminthic infection of 72.4% in free range chickens in both sex and age group of chickens in Digalu and Tijo District. This findings is higher than the report by other researchers from different parts of country such as 41.4% by Tesfaheyw et *et al.* (2012), 59.64% by Yehualashet.(2011) and 37.6% by Shiferaw *et al.*(2012) in south eastern Ethiopia, in and around Haramaya and in and around Haramaya Woreda districts respectively. Moreover the current finding is also higher as compared to the results of Mature *et al.*(2010) who reported prevalence of 53.00% in Nigeria, and from other countries such as53.00 % by,Baboolal *et al.* (2012) who reported 10.5 %, in Trinidad. In contrary to the finding of Eshetu *et al.*(2001), who reported prevalence of 91% the present finding is lower.At the same time the results reported by 90.21%by Ashenafi and Eshetu. (2004) with the rate of 90.21% and Negesse,(1993) having the rate of 88% in Central Ethiopia and Southern Ethiopia respectively are higher as compared to the present finding. Similarly the present finding is lower as compared to the findings of other countries such as Morocco reported by Hassouni *et al.* (2006) with the rate of 89.9% and Yoriyo *et al.*(2008) who reported the rate of 87.7% Nigeria and Katoch *et al.*(2012) who reported the rate of 88.5%in India.The current finding compared to the other countries and districts with regard to the intensity of prevalence of parasitic helminthes indicated that the rate were varied from different region and countries. The probable reason for such type of difference found in the prevalence of parasitic helminthes might be due to the management and the environmental related factors. The other reason might be due to difference in the season of conducting these studies, availability of intermediate hosts, individual host resistance and ecological parameters.

The present study also indicates that among the helminthes infected backyard chickens, overall infection withnematode infection was found in 134 (39.00%),whereas cestode was 92 (26.74%), with 149 (43.31%) chickens showing mixed infection, both cestode and nematode whereas about 100(29.06%) chickens showed single infection.This finding is slightly higher compared to the with the report of the other workers who reported the prevalence of nematodes and cestodes40.00% and 26.13% respectively by Naphade and Chaudhari,(2013)in India, 40.87% for nematode and 3.52% for cestodes by Solanki*et al.*(2015) in India. At the same time the present finding is higher than 1.56% and 19.1%, cestode and nematode respectively in south eastern Ethiopia reported by Tesfaheywet *et al.*(2012), 4.1% and 5.5%, cestode and nematode respectively by Baboolal *et al.*(2012) in Trinidad, but lower than prevalence of cestodes 86.32%, and nematode 75.79% reported by Ashenafi and Eshetu. *(*2004), cestode 83.00% and nematode 58.00%indicated by Heyradin *et al.*(2012) and 72%, nematodes and 64.67%cestodesby Yacob *et al.*(2009) in central Ethiopia, Eastern Shewa Zone and three agro-climatic zones in Oromia Region respectively. Similarly, the present finding compared to other countries like Algeria with the rates of cestodes 95.61%, nematodes 93.86% reported by Fouzia *et al.* (2013) was lower. The relatively low levels of helminth infestations observed in Digalu and Tijo District as compared to other research report could be attributed to the hot and dry conditions during sampling, which negatively affect the development of parasite eggs into infective stages and their survival in the environment (Permin& Nansen, 1998).

In the present study, four species of nematodes were identified. The most frequent nematode species

encountered was *Ascaridia galli*(38.37 %) followed by *Heterakis gallinarum*(33.43%). These the present finding on the prevalence of nematodes are less compared with the previous studies from various parts of Ethiopia, by Yacob *et al*. (2009) who reported prevalence of (44 %) of *A. galli* but higher when we look the finding of*H. gallinarum*with rate of (28.67%) reported by same author. The prevalence of cestode in the current finding is slightly higher compared with the prevalence's of 35.58% reported by Eshetu *et al*. (2001), 38.00% by Tesfaheywet *et al*.(2012), 37.3% in Arkansas by Wilson *et al*. (1994). At the same time, the present finding is higher than the previous reports 10.3% in Kenya by Irungu*et al*.(2004), 5.8% in Trinidad by Baboolal *et al*. (2012), 25.7% in Pakistan by Sayyed *et al*.(2000) but lower than the reports, 75.6% in Palestine by Rayyan and Al-Hindi,(2010). This shows, in the free-range and backyard poultry production systems there was infestation of *Ascaridia galli*, but different numbers werereported by different investigators. This result strongly suggested that *A. galli*is the common and most important helminth infection of poultry. Infestation with *A. galli* causes reduction in the growth rate and weight loss, which may be related to damage to the intestinal mucosa. *A. galli* significantly affects the health of chickens by sharing the feed consumed by the host, thus causing stunted growth and reduced egg and meat production (Eshetu*et al..,* 2001; Ashenafi and Eshetu, 2004).In general scavenging chickens are also exposed to the open air and environment and have greater contact with host organisms such as insects and the earthworm where they can be infested. Insects and earthworms are intermediate hosts that may indirectly transmit the parasite eggs and infective stage of nematodes to chickens on consumption (Butcher & Miles, 2009).

In thepresent study, six species of tapeworms were identified.The principal cestode species identified were*Raillietina echinobothrida* with the rate of (13.18%), *Raillietina tetragona,* having the rate of (10.75%), *Raillietina cesticillus*, with the rate of (6.25%), *Davainea proglottina*, *Choanotaenia infundibulum* and *Amoebotaenia cuneata*, with the rates of 7.55%), 5.46% and 1.7% respectively. This investigation is similar with the previous reports of other researchers (Eshetu*et al*., 2001) from Ethiopia, (Mamashly *et al*., 2011) from Iran. From recorded cestode spp during this research Raillietinaspp. has relatively higher prevalence. This can be attributed to the wide spread and ease accessibility of inter-mediate hosts (dung beetles, ants) to the local scavenging chickens. Dung beetles and ants were very commonly observed in the study area. Raillietina echinobothrida induces the formation of nodules in the intestinal wall, which can lead to confusion with lesions of avian tuberculosis (Calnek *et al*., 1991;Gedioin, 1991; Bersabeh, 1999) also reported similar findings, but 100% infection with R. tetragona was reported from Zimbabwe (Permin*et al*., 2002).

In the present study, mixed infections up to five species of helminthes parasites were recorded in most chickens originated from the study area. Mixed infection up to 6, 7, 10 and13 species of GI helminthes were reported in Central Ethiopia (Ashenafi and Eshetu,2004), Dire Dawa, (Gedion, 1991), Addis Ababa, (Abebe*et al.*, 1997) and Debre-zeit, (Bersabeh, 1999) respectively. Multiple infections with helminthes in rural chickens indicate that the prevailing environmental conditions and the management systems in the free-range are favorable for the simultaneous development of different helminthes species (Kabatange and Katule, 1990; Pandey *et al*., 1992).

Statistical analysis did not show significant relationship between the helminth infection of studied chickens and their age ($p > 0.05$). Moreover, relationship between the infection and sex of chickens were studied and there was not significant relationship between them ($P>0.05$) .This finding is in agreement with research conducted in selected districts of Eastern shewa zone by (Heyradin, *et al*., 2012), and Morocco which stated that that the prevalence of helminth infections did not differ significantly between male and female chickens as reported by (Hassouni, *et al*., 2006). But in contrary to the current finding (Abdelqader*et al*., 2008) in Jordan, reported that the prevalence of *A. galliand R. cesticillus* were higher in male than female hosts while those of *C. infundibulum*and *H. carioca* were higher in females.

5. CONCLUSION AND RECOMMENDATIONS

This study indicated that helminthic infection particularly nematode and cestodesare the most predominate parasites affects chicken in the study area. The present finding also revealed that groups of chicken with regard to the rate of parasites, both male and female and young and adult chicken were affected by the different species of the parasites. The common parasites identified parasites affecting chickens in the study are revealed that around six parasites namely *Raillietina echinobothrida, Raillietina tetragona, Raillietina cesticillus, Davainea proglottina, Choanotaenia infundibulum* and *Amoebotaenia cuneata,* from cestode were identified but there is also mixed type of infection identified in some portion of the chickens. Similarly the common nematode parasites identified in the present finding are *Ascaridiagalli, Heterakisgallinarum, Syngamus trachea* and Capillaria spp. These indicate endo-parasites are major problem of poultry in the study areas which merits the attention of different stakeholder involved in this sectors. Therefore, further large-scale studies may be required to devise appropriate prevention and control methods, with improved management systems.

Based on the above conclusive remarks, the following points are recommended

- ✓ Regular treatment of chickens against internal parasites using effective medicament is required
- ✓ Continuous surveillance and monitoring of poultry houses and other risk factors should be in place
- ✓ Awareness creation and sensitization of the community on the means of prevention and control strategies

focusing on the internal parasites affecting poultry is mandatory
- ✓ Further detail research should be carried out

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Statutory Declaration

I declare that this thesis presents the work carried out by myself and does not incorporate without the acknowledgement of any material previously submitted for a degree or diploma in any university; and to the best of my understanding, it does not contain any materials previously published or written by another person except where due reference is made in the text; all substantive contributions by others to the work presented including jointly authored publications, is clearly acknowledged.

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