Helminthosis of Chickens in Selected Small Scale Commercial Poultry Farms in and around Haramaya Woreda, Southeastern Ethiopia

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Helminthosis of Chickens in Selected Small Scale Commercial Poultry Farms in and around Haramaya Woreda, Southeastern Ethiopia

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Abstract

A cross-sectional study was carried out in three selected small scale commercial poultry farms in and around Haramaya woreda, Southeastern Ethiopia, from November 2011 to April 2012 with the aim of determining the prevalence and associated risk factors of helminthosis. For this purpose 384 chickens were randomly selected from different age groups of both sexes, kept under various management systems. Simple salt floatation technique was employed for coprological examination in the study. The fecal sample examined revealed an overall prevalence of 159 (41.4%), harboring one or more genera of helminth parasites. Among the helminth parasites recovered 73 (19.01%) and 6 (1.56%) were nematodes and cestodes respectively. While, the rest 80 (20.8%) were mixed infestations. The major helminth parasites recovered in the farms include Ascaridia galli (38%), Heterakis gallinarum (3.9%) and Raillietina sp. (22.4%). There was statistically significant difference (p<0.05) in the prevalence of helminth parasites in different management systems, with more parasite eggs recovered in in deep litter system 157 (45%) than their relative variables. In this study helminthosis was independent of sex and age (P>0.05). The study indicated that helminth parasites are highly prevalent in small scale poultry farms in the study area. Therefore, sustainable ways of controlling these parasites and further studies on period prevalence of helminth parasites in chickens need to be designed for improved intensive egg and poultry meat production.

Keywords: Chickens, helminthosis, prevalence, management system, risk-factors, Ethiopia

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Introduction

The total poultry production of Ethiopia is estimated at 56.5 million, of which about 99% are raised under the traditional backyard system of management, while 1% are exotic breeds maintained under intensive management system (Ashenafi and Eshetu, 2004). Poultry production system in Ethiopia is an indigenous and integral part of the farming system that ranges from nil input traditional free ranges to modern production system using relatively advanced technology. There is also a small-scale intensive system with small number of birds (from 50 to 500) as an urban and peri-urban small-scale commercial system using exotic birds and relatively improved feeding, housing and health care (Mekonnen, 2007; Simeamelak et al., 2011).

In the last few years, with the increase of poultry production, several problems were risen which led people to refrain from investing in poultry farming for fear of mortality due to bacterial, viral and parasitic diseases (Sayyed et al., 2000). Although parasitic diseases are among the major causes that decrease productivity of chickens, they are often neglected as they are rarely lethal. Helminthiasis was considered to be an important problem of local chickens and helminth parasites were incriminated as major causes of ill-health and loss of productivity in different parts of Ethiopia (Ashenafi and Eshetu, 2004). Parasitism is one of the major problems which inflict heavy economic losses to the poultry in the form of retarded growth, reduced weight gain, decreased egg production, diarrhea, obstruction of intestine, poor feathers, replacement birds that take long to reach maturity, morbidity and mortality. Stress from parasites could affect the blood picture and cause anorexia (Shah et al., 1999; Dube et al., 2010). Moreover, some of the poultry worms such as Heterakis gallinarum are associated with the transmission of Histomonas meleagris in turkeys and chicks. It has also been reported that parasitic infection or their concurrent infections result in immunosuppression, especially in response to vaccines against some poultry diseases (Nnadi and George, 2010).

Helminth parasites of poultry are commonly divided into three main groups; nematodes, cestodes and trematodes. Nematodes constitute the most important group of helminth 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 Rillietina and Hymenolepis (Matur et al., 2010). In the commercial table egg production systems the most commonly occurring helminth species are Ascaridia galli, Heterakis gallinarum and Capillaria spp (Roy, 2002).

The prevalence and intensity of helminth infections may be influenced by several factors, including host factors, such as age, sex and breed, can also influence helminth infections. Furthermore, climatic conditions (temperature and humidity) may alter the population dynamics of the parasites, resulting in dramatic changes in the prevalence and intensity of helminth infections (Magwisha et al., 2002). Many insects that may act as vectors for helminths are also favored by high temperatures and to some extent humidity. These factors may explain the wide range and distribution of nematode and cestode species in poultry, especially during the tropical rainy season (Dube et al., 2010).

In the past several studies have analyzed the incidence of helminth parasites in free-range or backyard chickens in different parts of the country (Teshome, 1993; Eshetu et al., 2001; Ashenafi and Eshetu, 2004), but researchers and other stakeholders didn’t give attention to the effect of parasites on commercial poultry farms. Hence considering the economic importance of the diseases in the farms and dearth of information in the area, studies designed to address the economic importance of helminth parasites in commercial poultry farms are warranted. Therefore this study aims to determine the prevalence and identify the common helminth parasites in selected small scale commercial poultry farms in Eastern Hararghe zone, Ethiopia.

Materials and Methods

Study area description

The study was conducted in three small-scale commercial poultry farms which are found in and around Haramaya woreda from November 2011 to April 2012. The woreda is found in Eastern
Hararghe zone, Eastern Oromiya, 506 km far from East of Addis Ababa and 14 km West of Harar town. The study area included Adelle, Haramaya and Harar towns. Adelle and Haramaya towns are 502 and 506 km far from East of Addis Ababa respectively. These areas are at an altitude of 2000 meters above sea level (masl) and geographically located at 41°59′58″ latitude and 09°10′24″ longitudes. The mean annual temperature and relative humidity are 18°c and 65% respectively and receives an average rainfall of 900mm³ (HADB, 2009). Whereas Harar town is in the mid-land temperature (woyna dega) of Harar town with the annual rain falt ranges between 275-1000mm³. It is also located at an altitude of 1800 masl and at 42°03′03″ latitude and 09°11′49″ longitudes (HAOR, 2009).

**Study design**

A cross-sectional study was carried out in three selected small scale commercial poultry farms found in and around Haramaya woreda, eastern Ethiopia, from November 2011 to April 2012 with the aim of determining the prevalence of helminth parasites. The three towns were purposively selected on the basis of accessibility and closeness to the laboratory for processing the sample. There are only 3 farms in the 3 selected towns in and around Haramaya Woreda each farm situated at Haramaya, Adelle and Harar towns.

**Study population**

A total of 384 chickens, 128 chickens from each farms were selected randomly to determine the prevalence of helminth parasites. Chicken of different age groups and both sexes kept in cage and deep litter system were included in the study. In general, age and sex of chickens was determined by asking the workers and attendants in the farms. Identification of sex of baby chicks was carried out by the method described by Jett (2011). The chickens were grouped into three age categories, namely chicks (<6 months), growers (6-12 months) and adults (>12 months) following the method used by Magwisha et al. (2002) with some modification.

**Study methodology**

**Sampling method**

Purposive random sampling technique was used to collect a fecal sample from individual chicken and iodine was used to mark the head of sampled chicken to avoid redundancy. The fecal samples collected were transported to Haramaya University, College of Veterinary Medicine parasitology laboratory for immediate processing.

**Fecal sample collection**

For each of the birds faecal samples were collected per cloacae where possible or with a spatula from freshly voided faeces. Faecal samples from the 384 chicken were put into labeled sample bottles and were transported to Haramaya University veterinary parasitology laboratory for processing. The observation of parasitic eggs in the feces was evaluated by coprological flotation technique by using sodium chloride solution as flotation medium.

**Coprological examination**

Three (3) gram of feaces was suspended in 45 ml of sodium chloride floatation fluid and the suspension was poured through tea strainer in to beaker for filtration. The filtrate was transferred in to test tube and covered with cover slip. The cover slip was taken up vertically after10 minutes and placed on microscopic slide for parasitic eggs examination under (10X) magnification (Tylor et al., 2007). Identification of the helminth eggs was carried out by the identification key described by Soulsby (1982).

**Statistical Analysis**

The data obtained were recorded and entered in to Ms-excel 2007 and later on analyzed by using SPSS version 20.0 statistical software program. Chi-square ($\chi^2$) test was done to analyze the association between prevalence and the explanatory variables such as age, sex, and management system. In all cases $p<0.05$ was considered as statistically significant.

**Results and Discussion**
The overall prevalence of infection with gastro-intestinal helminthes was 41.4% (159/384). Out of 384 chickens subjected to coprological examination 73 (19.0%) were found to be infected by nematode and 6(1.6%) by cestode parasites, while 80 (20.8%) had mixed infestation (Table 1).

Although helminth infection was more prevalent in males (52.1) than females (39.9%), and in adults (45.9%) followed by young chicks (38%) and growers (37.6%), there was no significance difference (P>0.05) in the prevalence of helminth parasites among sexes and age groups of the chicken. In the present study the association between the prevalence of helminth parasites and various explanatory variables such as age, sex, and management system were observed. The prevalence of helminth was significantly different (p<0.05) in the two systems of poultry keeping where it was higher in the deep litter system than the cage system (Table 2).

An effort was made to identify the species of nematodes and cestodes in chickens in the study farms. Consequently, the species of nematodes recorded from fecal examination were Ascaridia galli, which was present in 146 (38%) and Heterakis gallinarum in 15 (3.9%) of samples, whereas Raillietina species (22.4%) was the only cestode identified and was the second most prevalent in the present study (Table 3).

<table>
<thead>
<tr>
<th>Variables</th>
<th>No. Examined</th>
<th>Total No. Infected</th>
<th>Prevalence (%)</th>
<th>χ²(P-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>48</td>
<td>25</td>
<td>52.1</td>
<td>2.578(0.119)</td>
</tr>
<tr>
<td>Female</td>
<td>336</td>
<td>134</td>
<td>39.9</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicks</td>
<td>71</td>
<td>27</td>
<td>38.0</td>
<td>2.632(0.268)</td>
</tr>
<tr>
<td>Growers</td>
<td>141</td>
<td>53</td>
<td>37.6</td>
<td></td>
</tr>
<tr>
<td>Adults</td>
<td>172</td>
<td>79</td>
<td>45.9</td>
<td></td>
</tr>
<tr>
<td>Management System</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cage</td>
<td>38</td>
<td>2</td>
<td>5.3</td>
<td>22.708(0.000)</td>
</tr>
<tr>
<td>Deep litter</td>
<td>346</td>
<td>157</td>
<td>45.4</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>384</td>
<td>159</td>
<td>41.4</td>
<td></td>
</tr>
</tbody>
</table>

The present study revealed an overall prevalence of 41.4%. This finding is in consent with previous reports of 39.2% by Hirut (2009) from Ethiopia and 35.5% by Nnadi and George (2010) from Nigeria. Nonetheless, this finding disagree with the report of Yehualashet (2011) who reported a prevalence of 59.64% in Ethiopia and another report of 53% by Matur et al. (2010). This discrepancy could be related to the differences in the management system and control practices in the farms.

The study indicated that 6 (1.56%) and 73 (19.01%) of the examined chickens were infected by cestodes, and nematode species, respectively.

Table 1: Overall prevalence of gastro-intestinal helminth parasites of chickens

<table>
<thead>
<tr>
<th>Helminthes</th>
<th>No. of examined</th>
<th>No. of positive</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nematodes</td>
<td>384</td>
<td>73</td>
<td>19.0</td>
</tr>
<tr>
<td>Cestodes</td>
<td>384</td>
<td>6</td>
<td>1.6</td>
</tr>
<tr>
<td>Nematode + Cestode</td>
<td>384</td>
<td>80</td>
<td>20.8</td>
</tr>
<tr>
<td>Total</td>
<td>384</td>
<td>159</td>
<td>41.4</td>
</tr>
</tbody>
</table>

Table 3: Helminth parasite species identified upon coprology

<table>
<thead>
<tr>
<th>Helminth species</th>
<th>No. examined</th>
<th>No. positive</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ascaridia galli</td>
<td>384</td>
<td>146</td>
<td>38.0</td>
</tr>
<tr>
<td>Heterakis gallinarum</td>
<td>384</td>
<td>15</td>
<td>3.9</td>
</tr>
<tr>
<td>Raillietina sp.</td>
<td>384</td>
<td>86</td>
<td>22.4</td>
</tr>
</tbody>
</table>

The higher prevalence of nematodes over cestodes has also been reported in in commercial layers in Pakistan (Sayyed et al., 2000). This study disagrees with the report of Ashenafi and Eshetu (2004) in backyard chickens in central Ethiopia, who documented prevalence of 86.32% and 75.79% of cestodes and nematodes, which was by far higher than the result of the present study, this divergence may be due to indoor management of the chickens and lesser access to intermediate hosts together with less availability and contact with another flock’s faeces in the present study. Trematodes were not isolated in this study. It may be due to the absence or lesser occurrence of the snail intermediate hosts responsible for transmission of trematodes in the study areas (Magwisha et al., 2002).

As was observed in previous studies done by Magwisha (2002), Ashenafi and Eshetu (2004), and Hirut (2009), the result of the present study showed that there is no usually a natural affinity of helminth species to either sex of the host. In the contrary, the study in local and exotic chickens in Nigeria by Matur et al. (2010) revealed that female birds were more infected with helminth parasites than the males. These authors suggested that females are voracious in their feeding habits especially during egg production than the males which remain largely selective, which could increase the risk of infection. However, further researches should be conducted to come up with a plausible explanation about the association of sex with infection rate of helminth parasites.

Helminth parasites were more prevalent in the deep litter management systems than in the cage system (p<0.05). This difference could be explained by the fact that chicken kept in the deep litter are more exposed and accessible to the fecal materials of other chickens. Parasitic infections in cage birds may be recovered in chickens transferred from deep litter.

The species of nematodes recorded from the study were A. galli and H. gallinarum with prevalence of 38.0% and 3.9%, respectively. The dominance of A. galli over H. gallinarum has also been observed by several studies. Prevalence of 35.58% and 17.28% in Central Ethiopia (Eshetu et al., 2001); 25.7% and 8.25% from Pakistan (Sayyed et al., 2000); 25.63% and 1.43%, in indigenous chicken from Kenya (Kaingu et al., 2010); 48.39% and 35.48% from Nigeria (Nnadi and George, 2010); 75.6% and 68.9% in Palestine (Rayyan and Al-Hindi, 2010) have been reported for A. galli and H. gallinarum respectively. This result strongly suggested that A. galli is the commonest 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. The parasite was sometimes observed in the abdominal cavity after penetrating the intestinal lumen. This may be accompanied by damage to the intestinal wall, leading to blood loss and secondary infection which could result in loss of weight and reduced production. 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). Although this and other studies showed that H. gallinarum was recorded with a relatively lower prevalence compared with A. galli, its pathology and its role as a carrier of an important pathogen namely, Histomonas meleagridis in turkeys and chickens (Ashenafi and Eshetu, 2004) should be highly regarded.

The prevalence of H. gallinarum in this study was by far lower than other studies in Ethiopia, Kenya, South Africa and Pakistan (Sayyed et al., 2000; Eshetu et al., 2001; Kaingu et al., 2010; Mwale and Masika, 2011). The lower prevalence in the present study might be due to the fact that the chickens are kept confined hence lesser chance for infection with helminths. A closer agreement in the prevalence of H. gallinarum amounting 4% has been reported in guinea fowls (Junker and Boomker, 2007). Even more, a prevalence of as low as 1.43% has been reported in indigenous chicken from Kenya (Kaingu et al., 2010).

The prevalence of cestodes in this study (1.6%) was lower than other studies conducted by Rayyan and Al-Hindi (2010) in free range chickens in Palestine, and Shah et al. (1999) in indigenous and exotic layers at Faisalabad area of Pakistan. This could be due to difference in the season of conducting these studies, availability of intermediate hosts, individual host resistance and ecological parameters. The presence of only...
Helminthosis of Chickens in Selected Small Scale Commercial Poultry Farms in and around Haramaya Woreda, Central Ethiopia.

Rallietina sp. could also explain by these same phenomena and the possible management practices applied in the farms. Parasitic cestodes in poultry are known to cause retarded growth, enteritis, diarrhea and hemorrhages even in severe cases it may cause death of young birds. Thus the 1.56% in the present finding should not be undermined.

Not far from the finding of the present study, few or not at all trematodes were reported in chickens (Jenkins, 2007; Abdelgader et al., 2008). This could be due to the management of chickens under confinement which reduce the chance of contact of chickens with intermediate hosts; moreover, it could also be because of lack of conducive environment for the perpetuation of the intermediate hosts of trematodes (Junker and Boomker, 2007; Abdelgader et al., 2008).

Conclusion

The present study revealed a high prevalence of helminthosis in small scale commercial poultry farms in and around Haramaya woreda. A. galli was the most prevalent parasite affecting the health of chicken which could share the feed consumed by the host, thus causing stunted growth and reduced egg and meat production. Minimal health care and improper sanitation are among the major factors for the higher prevalence of helminth parasites in the farms. Therefore, sustainable ways of controlling these parasites and further studies on period prevalence of helminth parasites in chickens need to be designed for improved intensive egg and poultry meat production.

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