Prevalence of *Ascaridia galli* in Intensive Poultry Production System in Eastern Hararghe Zone, Eastern Ethiopia

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**Abstract:** A cross-sectional study was conducted from November 2013 to April 2014. A total of 384 faecal samples were collected from chicken for coprological examination, from which 137 (35.7%) found to be infected by *Ascaridia galli* (*A. galli*). The result indicates that among the breeds White leg horn was found the highest prevalence of infection 44.9% followed by Egyptian Fayoumi (30.8%) and Bovans Brown (30.2%). Deep litter system was found with higher prevalence (42.00%) than the cage system (28.8%). However, the differences in the prevalence of *A. galli* in the housing system were found to be statistically significant (*p* < 0.05). There was no statistically significant difference (*p* > 0.05) in the prevalence of *A. galli* infection in male (34.9%) and females (36.0%) and the difference in the prevalence of *A. galli* in age groups (less than 6 month’s 36.7%, 6-12 month’s 35.2 and above 12 month’s 35.5%) was found to be statistically insignificant (*p* > 0.05). It can be concluded that the results of this study confirms the higher risk of *A. galli* infections in floor system compared to indoor battery cage and litter system.

**Key words:** Ascaridia Galli · Coprological · Haramaya · Poultry · Prevalence

**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% is exotic breeds maintained under intensive management system. The intensive management system is characterized by high in put, high output and low destruction of the flock due to disease outbreak as compared to the backyard poultry production system [1].

Despite the presence of large number of chicken in Ethiopia, contribution to national economy or benefit from the sector is very limited due to disease, nutritional and management factors. Although the prevalence of parasitic infections has been greatly reduced in the commercial production system, mostly due to improved housing, hygiene and management operation, a large number of helminthes are still widely distributed throughout the world [2].

Common poultry parasites range from helminthes, lice, mites, fleas, ticks and coccidia. Parasitism causes reduced growth, egg production, emaciation and anemia as well as mortality. Moreover, it has been reported that concurrent parasitic infections result in immunosuppression. Studies in other countries had shown that the prevalence of parasitic infestations in village chicken flocks is close to 100% and in most cases individual birds’ harbour more than one parasite type [3]. In the commercial table egg production systems the most commonly occurring Helminths species are *Ascaridia galli*, *Heterakis gallinarum* and *Capillaria species* [2]. *A. galli* is the most common worm found in birds causing great economic loss in modern poultry. These live in the central portion of the small intestine which serves as a potential vector for salmonella enteric dissemination in poultry [4].

The life cycle of *A. galli* is faeco-oral; that is, the parasite passes directly from one bird to another via ingestion of parasite eggs. Eggs are shed in the faeces. Warm, damp conditions allow the worm eggs to survive in the environment for a long time. Occasionally, earthworms can act as transport hosts. After infection, it usually takes 40–60 days before the bird starts to pass parasite eggs in its droppings; but the prevalence and intensity of infection may be influenced by several factors, including host factors (Age, sex and breed), climatic conditions (Temperature and humidity) [5].
Infestation with *A. galli* significantly affects the health of chickens by sharing the feed consumed by the host and related to damage to the intestinal mucosa, thus causing stunted growth, weight loss and reduced egg and meat production. The parasite 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 [6]. Considering the economic importance of the disease and lack of detailed information in this area the study was conducted to investigate the prevalence of *A. galli* in Haramaya University intensive poultry farm and to identify major risk factors of the parasitism.

**MATERIALS AND METHODS**

**Study Area Description:** The study was conducted in Haramaya University which is found in Oromia region, Eastern Hararghe zone located 514 km far from East of Addis Ababa and 14 km West of Harar town. The elevation of the area is about 2000 meter above sea level and geographically located at 41°59'58" latitude and 09°10'24" longitudes [7]. The area receives an average rain fall of approximately 900mm and with bimodal distribution pattern, peaking in mid-April and August. There are four seasons, a short rain season (From mid-March to mid-May), a short dry season (From end of May to end of June), along wet season (From beginning of July to end of October) and a long dry season (From beginning of November to beginning of March). The area has 18°C mean annual temperature and 65%, humidity [7].

**Study Population:** The study animals were the chickens from intensive production system in Haramaya University poultry farm reared in deep litter and cage system. The breeds of the bird were White leghorn, Bovans Brown and Egyptian Fayoumi. Chicken of different age groups and both sexes kept in cage and deep litter system were included in the study. In general, age 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 [8]. 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.* [5] with some modification.

**Study Design:** A cross-sectional study was conducted from November 2013-March 2014 to estimate the prevalence of *A. galli* in intensively reared chicken in Haramaya University and also to identify the major risk factors of the disease (Types of breed, sex, age categories and the housing systems).

**Sample Size Determination:** A simple random sampling method was applied and a total of 384 chickens were sampled. The sample size was determined by Thrusfield [9] the formula with 95% confidence interval, 5% absolute precision (d) and 50% expected prevalence (P<sub>exp</sub>).

\[
 n = \frac{1.96^2P_{exp}(1-P_{exp})}{d^2}
\]

**Study Methodology**

**Coprological Examination:** For each of the randomly selected bird faecal sample was collected from the cloaca. Then faecal samples were put into sample bottles, label appropriately and transported to Haramaya university veterinary parasitology laboratory to be processed. Samples were kept in refrigerator at 4 °C to be examined for coproscopy. The observation of parasitic egg in the faeces was evaluated by using the coprological flotation technique by using sodium chloride solution as flotation medium [10].

**Data Analysis:** Appropriate data were collected from individual birds and stored in Micro Soft Excel spreadsheet. Data analysis was carried out by using computer based Statistical package for social sciences (SPSS version 20). Pearson chi-square test was used to evaluate the association between the possible risk factors and the disease and *p* < 0.05 was considered as significant.

**RESULTS**

Coprological examination was conducted on fecal samples generated from a total of 384 birds. Out of which 137 (35.7%) were found to be infected by *A. galli*. The result indicates that among the sampled breeds White leg horn chicken was found the highest prevalence (44.9%) compared to Egyptian Fayoumi (30.8%) and Bovans Brown (30.2%), but didn’t show significant difference (*p>*0.05) (Table 1). According to housing system higher prevalence was observed in deep litter systems (42.0%) than cage systems (28.8%), which showed statistically significant (*p* < 0.05) (Table 1).

The prevalence of *A. galli* infection on the basis of sex was 34.9% in males and 36.0% in females and based on the age categories the prevalence was 36.7%, 35.2%
Table 1: The prevalence of *A. galli* infection on the basis of breed and housing variation

<table>
<thead>
<tr>
<th>Variables</th>
<th>N(^f) examined</th>
<th>N(^f) of positives</th>
<th>Prevalence [95% CI]</th>
<th>(x^2) (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Breeds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bovans Brown</td>
<td>126</td>
<td>38</td>
<td>30.2[22.3-38.9]</td>
<td>8.0 (0.18)</td>
</tr>
<tr>
<td>White leg horn</td>
<td>138</td>
<td>62</td>
<td>44.9[36.5-53.6]</td>
<td></td>
</tr>
<tr>
<td>Egyptian Fayoumi</td>
<td>120</td>
<td>37</td>
<td>30.8[22.7-39.9]</td>
<td></td>
</tr>
<tr>
<td><strong>Housing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cage</td>
<td>184</td>
<td>53</td>
<td>28.8[22.4-35.9]</td>
<td>8.579 (0.014)</td>
</tr>
<tr>
<td>Deep litter</td>
<td>200</td>
<td>84</td>
<td>42.0[35.1-49.2]</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>384</td>
<td>137</td>
<td>35.7[30.8-40.6]</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: The prevalence of *A. galli* infection on the basis of sex and age

<table>
<thead>
<tr>
<th>Variables</th>
<th>N(^f) examined</th>
<th>N(^f) of positives</th>
<th>Prevalence [95% CI]</th>
<th>(x^2) (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>109</td>
<td>38</td>
<td>34.9[25.9-44.6]</td>
<td>0.04(0.47)</td>
</tr>
<tr>
<td>Female</td>
<td>275</td>
<td>99</td>
<td>36.0[30.3-41.9]</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;6 m</td>
<td>79</td>
<td>29</td>
<td>36.7[26.1-48.3]</td>
<td>3.7(0.054)</td>
</tr>
<tr>
<td>6-12m</td>
<td>105</td>
<td>37</td>
<td>35.2[26.1-48.3]</td>
<td></td>
</tr>
<tr>
<td>&gt; 12 m</td>
<td>200</td>
<td>71</td>
<td>35.5[28.9-42.5]</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>384</td>
<td>137</td>
<td>35.7[30.8-40.6]</td>
<td></td>
</tr>
</tbody>
</table>

and 35.5% in birds <6 month, 6-12 months and above 6 months of age respectively but all of the variables were statistically insignificant \((p > 0.05)\) (Table 2).

**DISCUSSION**

The present study the comparison between breeds revealed that high prevalence of *A. galli* was found in White leg horn (44.9%) followed by Egyptian Fayoumi (30.8%) and Bovans Brown (30.2%) in Haramaya University poultry farm. This finding in general is comparable with previous studies, 39.2% [11] and 38% [12] in and around Haramaya district of Ethiopia and also 40% in Nigeria [13] and 35.35% in India [14] but it was very low compared with the previous studies on chicken of Ethiopia (67.23%) [7]. This might be due to the effect of different management improvements.

The high prevalence of *A. galli* (42.0%) in the present study in the deep-litter floor might be result of continuous exposure of chicken to floor contaminated with fecal materials that would contain infective parasitic egg and transport host [15].

The Significant difference \((p<0.05)\) was seen between breeds and housing system this could be due to sampling strata in that the Bovans Brown were drown from the cage while, White leg horn and Egyptian Fayoumi were sampled from the deep litter-floor. Prevalence of infection was highest in the backyard compared to that of cage and litter system 51.8%, 30.1% and 40.38% respectively. In previous study prevalence of *A. galli* found to be significantly higher in the free range/organic systems (63.8%), deep-litter systems (41.9%) and the backyard system (37.5%) compared with the battery cage system (5%) [16].

The variation could be due to difference in housing condition and stock density which creates suitable condition for larval development and also supports persistence of larvae in environment for long period. However, the presence of transport host facilitate transmission. The prevalence of most parasitic diseases in poultry seems to have been reduced significantly in commercial poultry production, due to improvements in housing, hygiene and management [17]. Moreover, traditional poultry production is often described as a low input/low output system, where the poultry in flocks of 10-20 are mainly left scavenging around the house during day time. Here they obtain what feed they can get from the environment, often as leftovers from the kitchen, offal, insects and seeds [18]. The low productivity is mainly caused by diseases, suboptimal management and lack of supplementary feed [19].

There was no statistical significant difference \((p > 0.05)\) in the prevalence rate of *A. galli* infection in male (34.9%) and females (36%). However, the difference in the prevalence rate of *A. galli* in the age groups 6-12 month’s (36.7%), 6-12month’s (35.2%) and >12 months (35.5%) was found to be statistically insignificant \((p > 0.05)\). In older chickens, the histotropic phase is
considerably longer than in young chickens. The larval development to the adult stage is arrested at high infection rates not only due to the development of resistance but also due to density-dependent mechanisms [11].

In heavy infections, *A. galli* might cause partial or total obstruction of the duodenum or the jejunum followed by death. Adult worms may migrate through the lumen of the large intestine and cloaca and end up in the oviduct, where they can be incorporated into the hen’s egg [20].

**CONCLUSION**

The results of the prevalence study indicates that the prevalence of *A. galli* is high in the study area. The cross-sectional prevalence study on *A. galli* infections in Haramaya University intensive poultry farm is showed that *A. galli* infections are very common. It is important to note that the prevalence of *A. galli* infections in deep-litter system is higher compared to cage system. *A. galli* is the most important nematode species of considerable economic importance.

Therefore, hygienic measures should be improved in deep litter system and separate housing for different breeds and age grouped should be practiced. Further research should be conducted to confirm the health and productive performance of intensive poultry farms.

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**REFERENCES**


