

Prevalence of Coccidiosis among Indigenous Village and Exotic Poultry in Digalu and Tijo Districts of Arsi Zone, Ethiopia

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Abstract: Despite the presence of large number of chicken in Ethiopia, contribution to national economy and the benefit from the sector is very limited due to diseases predominantly coccidiosis. A cross sectional study was conducted to determine the prevalence of poultry coccidiosis and to recommend the possible preventive and control methods of poultry coccidiosis in Digalu and Tijo District between the periods of November, 2013 to March, 2014. A total of 384 faecal samples were collected from chickens and flotation technique was employed to harvest coccidian oocysts. The result revealed that 278 (72.4%) are positive for coccidia oocysts. Statistically significant ($P < 0.05$) prevalence of coccidiosis was observed in young (77.3%) compared to adult (67.2%) poultry. The prevalence was also significantly higher ($P < 0.05$) in Exotic (81.0%) than local breeds (66.4%) of chickens. However, no significant association ($P > 0.05$) was observed between sex groups. In conclusion, the present study showed that coccidiosis was an important disease of poultry in the study area. Hence, appropriate control and bio security measures and preventive measures based on good management practices need to be adopted to mitigate the losses which could result from coccidiosis in the poultry sector in Digalu and Tijo District.

Key words: Coccidiosis • Digalu and Tijo District • Poultry • Prevalence

INTRODUCTION

The Poultry industry occupies an important position in the provision of animal protein (meat and egg) to man and generally plays a vital role in the national economy as a revenue provider [1]. Approximately 20 billion poultry exist worldwide and of this about 75% are in developing countries [2]. Poultry is one of the most intensively reared of the domesticated species and one of the most developed and profitable animal production enterprises. Its importance in national economies of developing countries and its role in improving the nutritional status and income of many small farmers and those with small land holdings as well as landless has been recognized by various scholars and rural development agencies [1].

The total poultry population of Ethiopia is estimated at 49 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 [3].

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. Among those diseases are Newcastle disease, Coccidiosis, salmonellosis, chronic respiratory disease and nutritional deficiency [4].

Coccidiosis is one of a serious poultry disease that infects the epithelial cells lining of the intestines. It is a disease complex of poultry caused by different *Eimeria* species. The damaged tissue caused by coccidia results in lower feed intake, interference with normal digestion and nutrient absorption, dehydration and blood loss. Chickens suffering from coccidiosis quickly become less productive and, if they survive, poor performance continues the rest of their lives. Laying hens suffering from coccidiosis will experience a reduction in rate of egg production [5].

However, losses due to morbidity may be even more costly without the producers being aware that their flocks having any disease problem. The losses caused by coccidiosis without including the sub clinical coccidiosis are estimated to be 2 billion US\$ throughout the world. Quantitative losses due to coccidiosis in Ethiopia is not well documented, but has reported that it contributes to 8.4% loss in profit in large scale farms and 11.86% loss in profit in small scale farms. Losses due to mortality following a severe outbreak may be devastating and incidence rates as high as 80% were observed to occur in the form of an outbreak in Ethiopia [6].

In all parts of the world where confinement rearing is practiced, coccidiosis represents a major disease problem demanding the attention of poultry producers, feed manufactures and poultry disease experts [5]. The prevalence of coccidiosis around Digalu and Tijo *Districts* was not studied yet. Therefore, the objectives of this study were to determine the prevalence of coccidiosis among indigenous village and exotic poultry in Digalu and Tijo *Districts* of Arsi Zone, Ethiopia and to recommend the possible preventive and control methods of poultry coccidiosis.

MATERIALS AND METHODS

Study Period and Study Area: The study was conducted from November 2013 to March 2014 in backyard poultry production in Digalu and Tijo *District*. The zone is located 198 km Southeast to Addis Ababa at 07°45'N 39°09'E latitude and longitude & the elevation/altitude of the area is 2568 meter above sea level and it is one of the Twenty four *Districts* found in Arsi Zone of Oromia Regional State situated in the North Western part of the Zone. The area receives bimodal annual rainfall with the ranges of 900-1400mm, in which the long rainy season extends from June to September, while the short rainy season occurs from March to May. The minimum and maximum temperature is 18°C and 22°C, respectively. The area's agro ecology is highland (78%) & midland (22%) and it has a relative humidity of 19%. Poultry population in Digalu and Tijo *District* is estimated to be 52,265 out of which 2,500 are exotic breeds and 49,765 local indigenous breed. The main source of exotic breed is that the farmers were bought from the *District* Agricultural extension program [7].

Study Animals: The study was conducted on randomly selected local (indigenous) and exotic chicken selected from different peasant associations (PAs); including

those from ShaldoJigessa, Nannewa, Bura Jalle, Keji and Kel'a Kebeles were included in the study. Chickens were kept under backyard husbandry system. The study chickens were grouped into sex, breed and age as young and adult.

At the smallholder farmers level local strain chicken are reared in a traditional backyard system. The chickens feed by scavenging around the residence area and occasionally supplemented with food residues and cereals. The housing and nesting place provision are poorly and constructed from the locally available materials.

Study Design: A cross-sectional study was conducted from November 2013 to March 2014 to determine the prevalence of coccidiosis in extensively reared chicken in Digalu and Tijo *District* and the study design to compare the occurrence of this disease depending on the types of breed (Local and Exotic), sex (Male and Female) and as young (3-18 weeks) and adult (above 18 weeks) of age.

Sample Size Determination: Simple random sampling technique was employed to determine the sample size to be used in this study. To calculate the total sample size, the following parameters were used: 95% level of confidence interval (CI), 5% desired level of precision and with the assumption of 50% expected prevalence of coccidiosis in poultry in the study area the sample sizes were determined using the formula given in Thrusfield, [8].

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

Where,

n=required sample size,

P_{exp}=expected prevalence,

d²=desired absolute precision

By using this formula, the sample size was 384.

Study Methodology

Coprolological Examination: Faecal samples were collected from the cloaca of each chicken where possible or with a spatula for freshly voided faeces. During sampling age, breed and sex were recorded. The faecal sample were placed into sample bottles, using Potassium dichromate as preservative & identified appropriately and transported to Assela Regional Veterinary Laboratory to be processed. The observation of coccidian oocysts in the faeces was examined by using the concentration flotation technique using sodium chloride solution [9].

Data Management and Analysis: The raw data was entered and managed in Microsoft Excel worksheet and descriptive statistic was utilized to summarize the data. Computation of descriptive statistics was conducted using SPSS version 20. The prevalence of coccidiosis was calculated for all data, by dividing positive samples by total number of examined samples and multiplied by hundred. The association between the prevalence of the disease and risk factors was assessed by Chi-square (χ^2). A statically significant association between variables was considered to exist if the computed *p value* was less than 0.05 ($P<0.05$).

RESULTS

Overall Prevalence of Coccidiosis among Poultry: Out of 384 faecal samples taken from poultry and examined for the presence of oocysts of *Eimeria* species, 278 (72.4%) were proved positive on coprological examination.

Prevalence of Poultry Coccidiosis Between Ages: In the present study, prevalence of coccidiosis was recorded to be higher in young chickens (77.3%) and lower in adults (67.2%). There was a statistically significant ($P<0.05$) difference in the prevalence of coccidiosis between ages of birds (Table 1).

Prevalence of Poultry Coccidiosis Between Sexes: The prevalence of coccidiosis was confirmed to be higher in female (73.8%) than male chickens (67.8%). The occurrence of coccidian infection among chickens in relation to sex was not statistically significant ($p>0.05$).

Table 1: Prevalence of poultry coccidiosis between ages

Age	Examined	Positive	Prevalence (%)	χ^2	<i>p-value</i>
Adult	186	125	67.2	4.865 ^a	0.027
Young	198	153	77.3		
Total	384	278	72.4		

Table 2: Prevalence of poultry coccidiosis between sexes

Sex	Examined	Positive	Prevalence (%)	χ^2	<i>p-value</i>
Male	90	61	67.8	1.254 ^a	0.263
Female	294	217	73.8		
Total	384	278	72.4		

Table 3: Prevalence of poultry coccidiosis between breeds

Breed	Examined	Positive	Prevalence (%)	χ^2	<i>p-value</i>
Exotic	158	128	81.0	9.974 ^a	0.002
Local	226	150	66.4		
Total	384	278	72.4		

Prevalence of Poultry Coccidiosis between Breeds:

The results of coccidian infection in chickens in relation to breed were different. The prevalence was significantly higher ($P<0.05$) in Exotic (81.0%) than local breeds (66.4%) chickens.

DISCUSSION

In this study, the overall prevalence of coccidiosis among poultry was proved to be 72.4%. The overall prevalence of coccidiosis among poultry in this study was found to be higher than the findings of [10] (48.2 %) and [11] (38.34 %). The climatic conditions, agro-ecological set-up and lack of adequate information on the subject may be attributed to the variation. The relatively wet climate and cooler temperatures in the high and mid altitudes of the study area may be more favorable for the occurrence of coccidiosis. Observation showed that the husbandry methods and the environment which they are been kept are supported the development of oocysts through developmental stages. Poor poultry management where there is overcrowding, leaking water troughs and accumulation of faeces are factors that contributed to the high prevalence rate. This discovery gotten from this study also correspond with the statement and findings of [12] where he stated that overcrowding, accumulation of faeces and contamination of feed and water by faecal materials increases the number of *Eimeria* spp oocyst.

The finding of our study was also very close to the finding of Dinka and Yacob [13] who reported prevalence of coccidian to be 71.67% in Debre Zeit Agricultural Research Center of Poultry Farm. The prevalence of the coccidiosis was significantly higher ($P<0.05$) in exotic breed (81.0%) than local breed (66.4%). Higher prevalence in exotic breeds was also reported by Dinka and Yacob [13] who stated that, the frequency occurrence of coccidian infection in Rhode Island Red (RIR) breed was significantly higher than the local strain and this could be due to management system and breed factor. The higher oocyst in exotic breed can be related with the higher frequency occurrence of coccidiosis in the deep litter system due to relatively higher oocyst accumulation in the deep litter. This could also be justified by the fact that amount of oocyst discharged from infected chicken depends on the dose of oocysts ingested and the immunological status acquired from pre-exposure [14]. Thus, the chances of the chickens to pick-up large number of sporulated oocyst can be more likely in the exotic kept in deep litter management than the local strain

chickens. The results of this study are consistent with the finding in large and small-scale deep litter rearing systems [10].

This study also indicated that the prevalence of coccidiosis was relatively higher in female (73.8%) than male (67.8%) chickens. The result agrees with the previous studies [15] who stated that lesion score values were not significantly different between male and female in both RIR and local strain of chickens. This indicates that there was no significant natural resistance variation in relation to the sex [16]. Statistical analysis of the data showed that there was no statistical significant difference ($P>0.05$) between male and female chickens. This might be attributed to the fact that there is equal chance of exposure for the parasitic infection between sexes [17].

In the present study, the prevalence of coccidiosis was recorded to be higher in young chickens (77.3%) than in adult (67.2%) with a statistically significant difference ($P<0.05$) in the prevalence of coccidiosis between age of birds. This finding agrees with the report of McDougald and Reid, who stated that Most *Eimeria* species affect birds between 3 and 18 weeks of age and can cause high mortality in young chicks [18] The low prevalence of coccidiosis among adult birds (67.2%) in this study could also be explained by the fact that resistance to the disease usually increases with age of birds [19]. The high prevalence of coccidiosis in this study among backyard chicken could be brought by the maintenance of oocysts in the environment, improper cleaning and disinfection the houses of the native chickens and random scavenging behavior.

CONCLUSSIONS

In our study the prevalence of coccidiosis among indigenous village and exotic poultry in Digalu and Tijo districts of Arsi zone, Ethiopia was found to be high. The high prevalence of coccidiosis in this study indicates lack of appropriate control measures against the disease, poor management practices, improper cleaning and disinfection methods of the chicken houses and random scavenging system. Hence, appropriate bio security measures, good management practices and proper use of anti coccidial drugs should be implemented among the farmers to control this economically important parasitic disease of poultry.

Conflict of Interest Statement: The authors declare that they have no competing interests.

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