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RESEARCH ARTICLE OPEN ACCESS

Prevalence of Poultry Coccidios is in and Around Guder Town, West Shewa Zone, Oromia Regional State, Western Ethiopia

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ABSTRACT

A cross sectional study was conducted in and around Guder town, West Shewa Zone, Oromia Regional State, Western Ethiopia from November 2016 to March 2017 to determines the prevalence of coccidiosis and its associated risk factors in local strain and exotic breed chicken that are kept under free range and intensive management systems. Flotation technique was used to detect coccidian oocyst.In this study a total of 384 chickens were examined, as the result, prevalence of 97 (25.3%) was scored. The prevalence was found statistically significant (P<0.05) with in age groups, in which 40.1% <3 months (young) chickens and 13.8% ≥ 3 months (adult) chickens. There was also a significant difference (P<0.05) between the different management system with the prevalence of 18.3% under free range and (40.5%) intensive system. However, no statistically significant difference (P>0.05) was observed between breed and sex groups. In conclusion, the result of this study indicated that poultry coccidiosis is major threat to poultry producers in the study area and awareness creation among the society concerning the importance of the disease and conducting strict biosecurity measures should be applied in the prevention and control of the disease.

Key words: Coccidiosis, Exotic Breed, Local Breed, Prevalence

1. INTRODUCTION

The poultry sector is characterized by its industrialization, faster growth in consumption and trade than any other major agricultural sectors in the world [11]). Moreover, poultry in many parts of the modern world is considered as the chief source of not only protein of animal origin, but also of high quality human food [21]).Additional, in developing countries poultry production offers an opportunity to feed the fast growing human population and play important role to enable the landless poor farmers move out of poverty. The world poultry population has been estimated to be about 16.2 billion, with 71.6 % in developing countries [18].Global poultry production has increased dramatically in the last 20 years with more than 90 million tonnes of chicken meat and 1.1 trillion eggs now produced every year [15].In Africa, village poultry contributes over 70% of poultry products and 20% of animal protein intake [24].

In Ethiopia chickens are the most widespread and almost every rural family owns chickens, which provide a valuable source of family protein and income [31]. The total chicken population in the country is estimated to be 56.5 million with native chicken representing 96.9%, hybrid chicken 0.54% and exotic breeds 2.56% [8].

The poultry sector in Ethiopia can be characterized into three major production systems based on some selected parameters such as breed, flock size, housing, feeding, health, technology and bio-security. These are large scale commercial poultry production system, small-scale commercial poultry production system and village or backyard poultry production system [7]. The main objective of rearing chicken in all production systems is concerned with egg and meat production, for income generation and home consumption [5]. The total poultry egg and meat production in Ethiopia is estimated to be about 78,000 and 72,300 metric tons, respectively. Per capita consumption of these products is also very low relative to the world and African standards. Traditionally prepared dorowot is preferred by many people in Ethiopia. Despite this, per capita chicken meat consumption in the country is reported to be about 2.85 kg per annum [3].

The poultry industry is currently facing a number of problems [30]. In Ethiopia, poultry production has been hindered by different prevalent diseases from which Newcastle disease, coccidiosis, salmonellosis and chronic respiratory disease are the important ones [14].

Among the infectious diseases of poultry, Coccidiosis is an important parasitic disease that induces great economic loss particularly in poultry industry all over the word [26]. It is caused by the *Apicomplexa*protozoal parasite of genus *Eimeria*.*Eimeria*includes various species responsible for the development of coccidiosis. Infection by coccidia in sufficient number to produce clinical manifestations of disease is called coccidiosis [10]. All species of *Eimeria* invade the lining of the intestine; however, seven species are considered of economic importance, due to their proven pathogenicity namely, *E. acervulina, E. brunetti, E. maxima, E. mitis, E. necatrix, E. praecox*, and *E. tenella*. The significant role that *E.hagani* and *E. mivati* have in coccidiosis is still not well-established [36].

Clinical signs of the infection in chickens can range from none to bloody droppings, watery diarrhea, dehydration, lowered feed intake, weight loss, paleness, huddling, ruffled feathers, and depression. All ages of chickens are susceptible to infection, but the disease is more prevalent in 6-8 weeks of age. Several factors influence the prevalence of the disease such as high chicken density, high humidity, feed change, and management system, different age categories of chickens at same place and health status of the chickens. Susceptible chickens acquire the infection by ingesting infective (sporulated) oocysts in litter, soil, contaminated water and feed. The infected chickens excrete oocysts into the faeces and are major source of infection for other chickens. The infection can be transmitted by direct as well as indirect contact. The infective oocysts can also be mechanically spread by dust, equipment, insects, rodents, wild birds and as well as humans. The disease adversely affects the growth of the infected chickens and causes high morbidity and mortality. The infection can be controlled by good management including dry and clean litter and good ventilation. Since 1950s, the control of coccidiosis has been achieved through anticoccidial compounds administered in the feed, which reduce infections to a sub-clinical level [19].

Coccidiosisis endemic in Ethiopia, causing great economic losses, particularly in young growing birds in all production system. In Ethiopia, *E.acervulina, E.necatrix, E.maxima* and *E.tenella*are endemic in all parts of the country and affect many young growing birds. In the past years coccidiosis used to be the most important cause of mortality in all farms. Incidences of the disease were as high as 80% usually occurring in the form of outbreaks [29].

Quantitative losses due to coccidiosis in Ethiopia are not well documented, but it has reported that coccidiosis contributes to 8.4% loss in profit in large-scale farms and 11.86% loss in profit in small-scale farms [23].

In Ethiopia even though poultry coccidiosis have been studied by several researchers in different areas of the country, the disease is still continued being a major constraint in poultry production which needs more research and further investigations. There was no information regarding the prevalence of coccidiosis and their impact on poultry production in and around Guder town. Therefore, the objective of this study was to determine prevalence and appraise the associated risk factors of poultry coccidiosis in the study area.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in and around Guder town which is located in West Shewa Zone of Oromia Regional State, Western Ethiopia starting from November, 2016 to March, 2017. Geographically, Guder town located at a latitude and longitude of 9°11′N 38°20′E/ 9.183°N 38.333°E with an elevation of 2387meters above sea level (masl) and 126 Km west of Addis Ababa. The total land area of the district covers 78887 square kilometres.The agroecology of the study area is 27% highland, 55% midland, and 18% lowland. It has an annual rainfall and temperature ranging from 800 – 1100 mm and 16^{oc} to 29^{oc} respectively. The rainfall is bi-modal with the short rainy season from February to May and long rainy season from June to September. The population of the district was 134764, out of which 54874 were males and 79890 were females. The livestock population of the district includes 145410 cattle, 96349 sheep and goats,

84590 chickens, 34845 equines. The most important crops that grow in the area are teff, maize, sorghum and wheat. Crop and livestock sales are important source of income for all wealth groups; the poorer groups also do agricultural labour such as weeding, harvesting and sell firewood [34].

2.2 Study Population

The study animals were exotic and local breeds of chickens found in and around Guder town. Chickens were kept under backyard and intensive husbandry system. The study chickens were grouped into sex (male and female), breeds (exotic and local) and ages were classified as young (less than three months) and adult (greater or equals to three months) according to [9].Short interview with farmers and farm owners were made to assess risk factors like breed, age, management systems; at the same time, observational assessment was made to assess managemental practices in backyard and intensive poultry farms.

2.3Study Design

A cross sectional study design was conducted from November 2016 to March 2017 to determine the prevalence of coccidiosis in local strain and exotic chicken and to identify the risk factors of coccidiosis.

2.4 Sampling Method and Sample Size Determination

The four Peasants Association were purposively selected (Guder, Naga File, ImlaDaweAjo, Malka Naga) for the study animals, based on the accessibility of intensive husbandry system and closeness to the laboratory for processing the sample. Then, simple random sampling was applied and a chicken was selected randomly from randomly selected farms and households.

Since the prevalence of the disease in the area was not known, 50% expected prevalence and a 5% absolute level of precision was considered to calculate the number of animals to be sampled [33].

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

Where n = required sample size; P_{exp} = expected prevalence; d = desired absolute precision. Therefore, the total sample size required was384.

2.5 Study Methodology

Feacal Sample Collection, Transportation and Examination:

For each of the chickens faecal samples were collected per rectum where possible or from freshly voided faeces with a spatula, which was washed and cleaned after each collection in order to avoid contamination. Then, each faecal sample was placed in pre-labeled universal bottles from each chicken and was brought to Parasitology Laboratory of the Department of Veterinary Laboratory Technology, Ambo University Guder Campus for examination. During sample collection information regarding age, breed, sex and management system was appropriately recorded. The presence of fecal oocysts was determined using the concentration by flotation method [6].

2.6 Data Management and Analysis

The raw data were entered and managed using Microsoft Excel worksheet and descriptive statistics was utilized to summarize the data using SPSS version 20 statistical software. The prevalence rate was calculated by dividing positive samples by total number of examined samples and multiplied by hundred [33].Associations between the explanatory variables (sex, breed, age and management system) and prevalence of poultry coccidiosis were evaluated by a chi-square analysis. Differences were considered significant at value of $P<0.05$.

3. RESULTS

Out of 384 chickens examined for poultry coccidiosis, 97 (25.3%) were found positive. It was observed that the age of chicken was found to be significantly ($\chi2=34.56$; $p<0.05$) associated with the prevalence of coccidiosis where, it was higher 40.1% in young and lower 13.8% in adult chicken. Management system had a significant ($\chi2=21.72$; $p<0.05$) effect on the occurrence of poultry coccidiosis where it was higher in chicken reared in intensive (40.5%) than in extensive (18.3%) management system. The prevalence of poultry coccidiosis was not significantly ($\chi2=0.08$; $P>0.05$) varied between male and female chicken although male (26.2%) had a relatively higher prevalence than female (24.8%). Even though relatively higher prevalence was obtained in exotic (28.1%) than local breed (22.6%), statistically significant ($\chi2=1.53$; $p>0.05$) difference in the prevalence of diseases was not observed between breed of chickens (Table 1).

Table: 1 The prevalence of poultry coccidiosis with respect to age, sex, breed and management.

Risk Factors	Categories	N^{o}. Examined	N^{o}. Positive (%)	$\chi2$	P-value
Age	Young	167	67(40.1)	34.56	0.001
	Adult	217	30 (13.8)		
Sex	Female	254	63 (24.8)	0.08	0.773
	Male	130	34(26.2)		
Breed	Local	199	45 (22.6)	1.53	0.216
	Exotic	185	52 (28.1)		
Management	Extensive	263	48 (18.3)	21.72	0.001
system	Intensive	121	49 (40.5)		
Total		384	97 (25.3)		

4. DISCUSSION

The overall prevalence of coccidiosis found in this study was 25.3%. This occurrence level of poultry coccidiosis is roughly comparable with 25.8% reported in central Ethiopia [6] and 25% around Bishoftu town [12], but, higher than 19.3% and 19.5% in Yabello, Southern Ethiopia [1] and Nekemte town, East Wollega [16] respectively. In other related studies the prevalence of poultry coccidiosis was 80% in Addis Ababa [2], 70.95% in Tiyo district, Arsi Zone [17] and 71.1% in Bishoftu [13]. These differences might be due to variations in agro-ecology, the season during which the studies were conducted, sampling methods, breed of chicken and management practices of the study areas [27]. The possible explanation for this difference in the occurrence of coccidiosis among different reports, might be associated with lack of adequate information on the subject,environmental inconsistency and difference in awareness between poultry producer how the disease transmit, may brought this variation.

The prevalence of coccidiosis was relatively higher in younger (<3months) (40.1%) than adults (≥ 3months) (13.8%).There was a significant difference in poultry coccidiosis between different age groups ($p<0.05$). Similar pattern of prevalence with age was reported by previous findings with the prevalence rate of66.1% in young chickens and 43.3% in adults in Gondar town [5]. As the age of the chickens increases, they develop immunity against the disease [35]. This may be the reason why the disease rate decreases with increasing age of chickens. But, this result disagrees with the previous findings that were reported by [22], in Columbia and [28] in Ambo who stated that all ages of poultry are susceptible to infection. Despite of the fact, poor managemental practices and variation in age categories may cause this disagreement.

In this study, it was also found that there was statistically significant difference with the occurrence of poultry coccidiosis between different management system (intensive and extensive) ($P<0.05$). Chickens that kept under intensive management system were more affected (40.5%) than chickens kept under extensive (18.3%) management system. This finding is in line with [25] in Hawassa town, Southern Ethiopia who reported a higher prevalence of poultry coccidiosis in intensive than extensive management system. Coccidiosis is the most common to chickens under intensive management system especially those on deep litter system due to relatively higher oocyst accumulation in the deep litter system and it further exacerbate the risk

of coccidial infection as it provides optimal condition of temperature and humidity for oocyst sporulation [32]. This finding suggests that the exposure to coccidiosis was higher in intensive than the extensive management system. This is the fact that in intensive management system the exposure to contaminated coccidial oocyst was high as compared to the extensive management system. However, the current result disagree with the previous finding in Nekemte town, East Wollega that was reported as higher prevalence was found in chickens managed under backyard production system (27.6%) than intensive (11.5%) production system [16]. This variation might be due to the difference in managemental practice, chicken density, health status of the chickens and malnutrition.

The result of coccidiosis prevalence rate recorded in this study was relatively higher in those exotic breeds (28.1%) than local (22.6%) chickens. This could be linked to the fact that most of the exotic chickens were reared in confinement and were likely to be most exposed to the infective stages of the organism in litters and feed while the local breeds of chickens were usually found wandering and scavenging around the surroundings. They may not come into contact with the infection or may not ingest the infective stages of the organism. This agrees with the findings of [20] in Zaria, Nigeria; [28] in Ambo and [17] in Tiyo district, Arsi Zone, Ethiopia who also reported high prevalence of coccidian infection in exotic breed chickens as compared to the free range local chickens. However, the findings of this current study did not support previous reports [1] in Yabello, Southern Ethiopia who reported higher coccidiosis rate in local chickens (20.4%) than in exotic breeds (18.4%)and [4] in central Ethiopia has reported high prevalence of coccidiosis in indigenous scavenging chickens. This difference might be due to poor poultry management practices, malnutrition and presence of chickens of different breed type.

5. CONCLUSION AND RECOMMENDATIONS

The overall prevalence of poultry coccidiosis in the study population in study area was 25.3%. Different risk factors were considered, that were thought to be associated with prevalence of the disease. Among these different risk factors considered age and management system were found to be significantly associated with the prevalence of coccidiosis in study area. As the age of the chicken increase, the prevalence of the disease decrease. On the other hand the prevalence of the

disease was higher in intensive management system when compared to free range management system. The result of this study indicated that lack of appropriate control measures against the disease and poor management practices encouraging the disease occurrence. In addition to this poultry coccidiosis is major threat to poultry producers in the study areas which needs appropriate intervention.

Based on the above conclusion the following recommendations are forwarded:

- ✓ Poultry farm owners should be practiced strict biosecurity measures on their farms, for prevention and control of coccidiosis.
- ✓ Maintaining recommended stocking density and prohibits rising of different age groups in the same house.
- ✓ Awareness should be created among the local chicken farmers concerning the prevalence of coccidiosis and to use vaccination against the disease.

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