

Prevalence of Poultry Coccidiosis in Large and Small Scale Poultry Farms in and Around Dire Dawa, Ethiopia

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Abstract: A cross sectional study was conducted in Dire Dawa area, from October 2013 to May 2014 to estimate the prevalence of coccidiosis in chickens and to identify the possible risk factors of the disease during the study. Oocysts in each faecal sample of chicken was detected by flotation technique using saturated Sodium Chloride solution. In this study out of 384 chickens 164 (42.7%) were found to be positive for Eimeria species. The prevalence of poultry coccidiosis was significantly higher in young (50.8%) than adult (34.9%) ($P < 0.05$). The infection rate was also higher in exotic breeds (47.7%) than local breeds (38.2%) and in intensive management system (48.7%) than traditional management system (38.9%) but there was no statistically significant variation ($P > 0.05$). The probability of chickens being positive was high ($p < 0.05$) in apparently sick birds, 85%, 80% and 93.3% out of the total birds showing depression, diarrhea and weak body condition respectively. In conclusion the study indicates that coccidiosis is still the most important parasitic disease of poultry especially on the intensive management system in and around Dire Dawa. Therefore, further research for best control and prevention strategies like good sanitation and proper management of chickens should be designed and implemented.

Key words: Coccidiosis • Oocysts • Dire Dawa • Chickens • Prevalence • Ethiopia

INTRODUCTION

The world poultry population has been estimated to be about 16.2 billion, with 71.6 % in developing countries, producing 67, 718,544 metric tons of chicken meat and 57,861,747 metric tons of hen eggs annually [1]. In Africa, village poultry contributes over 70% of poultry products and 20% of animal protein intake. In East Africa over 80% of human population live in rural areas and over 75% of these households keep indigenous chickens and Ethiopia is not exception to this situation [2].

Ethiopia has large population of chicken, estimated to be 42 million with native chicken of none descriptive breeds representing 96.6%, hybrid chicken 0.55% and exotic breeds of chickens mainly kept in urban and peri-urban areas 2.85% [3]. From the total population of chicken in Ethiopia, 99 % are raised under the traditional back yard system of management, while 1 % is under intensive management system [4].

In the country village poultry plays a dominant role in total poultry production. The sector represents an

important part of the national economy in general and the rural economy in particular. In developing countries, many rural households keep poultry in their farmyard. Village poultry production plays an important role in improving the nutritional status, incomes, food security and livelihood of many small farmers and landless communities owing to its low cost of production [5]. Several factors have been suggested for low production. The system is characterized by low input and low output, with minimal management interventions, feed supplementation, housing and disease control. This kind of production by itself is a limiting factor to sound economic and sustainable production. The low input might be a result of the high risk due to high mortalities experienced in village poultry. Thus, the potential of the free-range chicken production has not been exploited in the country [6].

Poultry production in Ethiopia has been hindered by different prevalent disease among which important ones are Newcastle disease, coccidiosis, salmonellosis and chronic respiratory disease [7]. Coccidiosis in chickens is

one of the major problems of poultry industry that is caused by protozoan parasites of genus *Eimeria*. It is considered as one of the most economically important diseases of domestic poultry that is responsible for significant economic losses to the worldwide poultry industry [8]. It is caused by one or several of seven *Eimeria* species infecting chickens [9]. These species differ in their localization in the gut, shape of oocysts and in their ability to induce morbidity and mortality [10]. Coccidiosis infection occurs in the epithelial cells of the intestine, despite the advances in nutrition, chemotherapy, management and genetics. Most *Eimeria* species affect birds between 3 and 18 weeks of age and can cause high mortality in young chickens [8].

In Ethiopia, the previous studies showed that coccidiosis contributes to 8.4% and 11.86% losses in profit in large and small-scale farms, respectively [11]. Losses due to mortality following a severe outbreak may be devastating and incidence rates as high as 80% were sometimes observed in the country [12]. However the prevalence of the disease and associated risk factors were not yet addressed in and around Dire Dawa town. Therefore, this study was conducted to the prevalence of avian coccidiosis in poultry farms in and around Dire Dawa and to identify the probable risk factors of the disease.

MATERIALS AND METHODS

Study Area: The study was conducted in Dire Dawa area, from October 2013 to May 2014 which is situated 518 km east of the capital city, Addis Ababa, between 09°28'N to 09°49'N latitude and 41°38'E to 42°19'E longitude and the altitude range from 950 to 2250 m.a.s.l and encompasses an area of 1288.02 km². The rainfall pattern is bimodal with the average of 700 to 900 mm. The monthly mean maximum temperature ranges from 28.1°C in December and January to 34.6°C in May. The total population of the administration was estimated to be 341,834, out of which the urban population was 233,224 and that of the rural population, 108,610 [3]. The livestock populations owned by the rural peoples in and around the city are 43,124 head of cattle's 185,996 head of sheep and goats, 6,438 heads of equine, 7,260 head of camel and 34,199 of poultry [13].

Study Population: The study animals were chickens found in and around Dire Dawa town which are owned by local farmers and small scale poultry farms. The study animals was grouped into sex (male and female), breeds (exotic and local) and ages as young (2-8 weeks) and adult

(above 8 weeks of age)[1 and 15]. The principle is that the health status of chickens taken from the farm could reasonably reflect the actual health status of the population from which they are taken.

Sample Size Determination: The sample size was determined based on the formula recommended by [16]. Since the prevalence of chicken coccidiosis in and around Dire Dawa poultry farm had not yet been reported, 50% expected prevalence was used. In addition, 95% confidence interval and 5% desired absolute precision was also used. Therefore, the total sample size required was 384.

$$n = \frac{1.962 \times P_{exp} (1 - P_{exp})}{d^2}$$

where,

n = sample size required

Pexp = expected prevalence, d = desired absolute precision

Sample Collection and Sampling Strategy: A cross sectional study was done and qualitative fecal examination was conducted. A total of 384 fecal samples were collected randomly from selected chicken in the village and in purposively selected small scale poultry farms. The collected fecal samples were put in plastic bottles from rectum of each chicken and brought to Dire Dawa regional laboratory for examination. During sampling age, breed and sex was recorded. Oocytes in each fecal sample of chicken were detected by using flotation technique using saturated Sodium Chloride solution according to [17].

Data Management and Analysis: The raw data was entered in Microsoft Excel worksheet. The data was analyzed using SPSS version 20 statistical software. The association between the prevalence of the disease and risk factors was assessed by Pearson's Chi-square and statically significant association between variables is considered to exist if the computed *p values* less than 0.05.

RESULTS

The study revealed that, out of the total 384 chickens examined in area under study 164 (42.7%) were positive for coccidian oocysts. The prevalence of coccidia was variable based on different risk factors observed during the study time. The prevalence was higher in Bovans

Table 1: Prevalence of Poultry Coccidiosis based on breed, management and sex of chicken

Variables	¹ of examined	¹ of positives	Prevalence (%) [95% CI]	χ ² (p value)
Breeds				
Local	204	78	38.2 (31.54-42.28)	3.559 (0.059)
Exotic	180	86	47.7 (40.29-55.34)	
Management				
Backyard	234	91	38.9 (32.61-45.46)	3.572 (0.059)
Intensive	150	73	48.7 (40.43-56.95)	
Sexes				
Females	283	126	44.5 (38.64-50.52)	1.448 (0.23)
Males	101	38	37.6 (28.18-47.82)	
Total	384	164	42.7 (37.70-47.83)	

Table 2: Prevalence of poultry coccidiosis based on age categories of chicken

Age	¹ of Examined	¹ of Positive	Prevalence [95% CI]	OR[95% CI]	χ^2 value (p value)
Adults	195	68	34.9% [28.2-42.0]	1	9.944(0.002)
Young	189	96	50.8% [43.4-58.1]	1.93	
Total	384	164	42.7 (37.70-47.83)		

Table 3: Prevalence of poultry coccidiosis based apparentlyobserved health status of chicken

Health status	¹ of Examined	¹ ofPositives (%)	[95% CI]	χ^2 value (p value)
Apparently healthy	334	118(35.2)	[30.1-40.6]	45.46(0.00)
Depression	14	12(85.7)	[57.2-98.2]	
Diarrhea	20	16(80)	[56.3-94.3]	
Weak body condition	15	14 (93.3)	[68.1-99.8]	
Total	384	164	42.7 (37.70-47.83)	

Brown (47.7%) than local breeds (38.2%) of chickens. Based on the management system the higher prevalence intensive management system (48.7%) was recorded than backyard management system (38.2%). Prevalence was recorded 44.5% and 37.6% in female and male chickens, respectively. All the above risk factors are notsignificantly associated with the prevalence of the diseases ($P>0.05$) (Table 1).

The prevalence of 50.8 % and 34.9% were also recorded in chicken grouped under age category of young (2-8 weeks) and adult (> 8 weeks), respectively, thus it showed significant difference based on age group ($P< 0.05$) (Table 2).

Based on the observed health status of chickens the proportion of coccidiosis was 35.2%, 85.7%, 80% and 93.3% in chickens which were apparently healthy, showing depression, diarrhea and weak body condition respectively. The probability of being positive was significantly higher in chickens apparently sick ($p<0.05$) (Table 3).

DISCUSSION

Coccidiosis is the most prevalent intestinal parasitic disease of poultry worldwide. In this study, the overall prevalence was 42.7%. This result agreed with the finding of Ashenafi *et al.* [18] who reported a prevalence of coccidiosis 42.2% in Debre Behran. Moreover, this result was also in line with the finding of Netsanet [19] who reported a prevalence of 38.5% in Kombolcha. However, the present result disagrees with the findings of McDougald [8] who reported a prevalence of 70.95% in deep litter system of exotic breeds of chickens in Tiyo districts, Arsi Zone, Ethiopia and the report of 22.3% prevalence at Kombolcha [20]. This variation in prevalence of the disease might be due to the epidemiology of coccidian infection and hygienic measure taken during management practice and different localities [8].

The present finding was higher in poultry of backyard management system than intensive system

which means 38.9% and 48.7 % respectively but it was not significantly different ($P>0.05$). This results agreed with a result that reported by Ashenafi *et al* [18] (34.6%) in traditional husbandry system. However, the result was contradict with thereport of Fessesse-work [21] who reported that the prevalence of coccidiosis was (11%) in backyard poultry production system. This may be due to indiscriminate scavenging behavior and poor sanitary condition [8].

The prevalence of the disease was higher in exotic breeds (47.7%) than local chickens (38.2%). Higher prevalence in exotic breeds (80.65%) but 61.25% in local breeds was also reported [8] and concluded that the variation might be related with breed or genetic factors.

This study also indicated that the prevalence of coccidiosis was relatively higher in female (44.5%) than male (37.6 %) chicken. But, it was not statistically significant ($P>0.05$). Similar variation have been reported in the previous study [22]. Absence of statistically significant difference between male and female might be due to equal chance of exposure for the parasite infection.

The result of current study also revealed that the prevalence of coccidiosis was higher in young (2-8weeks) 50.8% than adult (greater than 8 weeks) 34.9% age groups. This finding agreed with the finding of other many researchers. The disease appears to reach climax at 5-7 weeks of age and exceeded at 7 weeks age, most birds will develop immunity and increase resistance to the disease [14 and 15]. However, this finding was disagreed with report which stated that all ages of poultry are equally susceptible to infection [23]

In this study the prevalence of coccidiosis was higher in apparently sick chickens with the proportion of 85.7%, 80% and 93.3% in chickens showed depression, blood mixed diarrhea and excessive poor body condition (emaciated) respectively than prevalence was observed in chickens apparently healthy 35.2%. The prevalence of the disease was statistically significant with the frequency of observable clinical signs of sickness ($p<0.05$). This implies that coccidiosis is an important disease that affects the apparently health status of chickens as well as it is a disease of might flare up during the chickens exposed to the other disease(s). This result is in agreement with the previous report [8].

CONCLUSIONS AND RECOMMENDATION

The result of this study indicated that coccidiosis is still the most important parasitic disease of poultry especially in intensive management system and at

younger age of birds in the study area. Also the prevalence of the disease was higher in apparently sick chickens than the healthy once. Therefore, demanding a lot of interventions and research to develop long-lasting immunity in young chickens and sustainable prevention and control strategies should be designed and implemented.

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