

## Prevalence of Poultry Coccidiosis and Associated Risk Factors in Intensive Farm and Individual Small Holder Poultry Farm in Benadir Region, Somalia

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### ABSTRACT

A cross sectional study was conducted from September 2021 to February 2022 in Mogadishu, Somalia to determine the prevalence of poultry coccidiosis and associated risk factors in intensive farm and Individual smallholder poultry farm in Benadir region-Somalia. The objective of the study was to determine the prevalence of poultry coccidiosis, to assess the risk factors associated with poultry coccidiosis. However, floatation technique was used for isolation of coccidian oocysts obtained from 384 fecal samples of chicken and the prevalence revealed was 19.8%. There was no statistically significant difference in poultry coccidiosis between the different ages of chicken ( $P>0.05$ ) where the young chickens (chicks) had shown slightly higher prevalence (20.4%) than adult chickens (18.8%). The effect of sex on the disease prevalence was assessed and relatively slightly higher prevalence was recorded in male chickens (20%) than female (19.4%). However, the difference between sex groups was not statistically significant ( $P>0.05$ ). According to the management system of the chickens, the study had shown a significant difference between extensive and intensive management systems, with the extensive system having a higher prevalence (25.5%) than intensive system (14%) with P-value (0.003). There was a significant difference in poultry coccidiosis between the different body condition score of chickens ( $P<0.05$ ), where those poor body condition (26.6%) are more prevalence than middle (16%) and good (8.8%) chickens. The study also revealed a statistically significant association between infection rate and housing methods with the chickens kept in floor house had a higher prevalence (25.5%) than cage house (14%) with P-value (0.003).

However, appropriate control strategies should be designed considering important risk factors such as age, management system and housing system. Especially, focus should be given to biosecurity practices in the prevention and control of coccidiosis, and in addition, further studies are needed to be conducted to identify the prevalent *Eimeria* species for strategic control.

**Keywords-** Prevalence of Poultry Coccidiosis and Associated Risk factors

## I. INTRODUCTION

The world's poultry population is estimated to be around 16.2 billion people, with 71.6 percent living in developing countries, producing 67, 718,544 metric tons of chicken meat and 57,861,747 metric tons of hen eggs each year (Gueye, 2005).

According to the Food and Agriculture Organization (FAO), there are approximately 20 billion chickens in the world, with about 75% of them in developing countries. Village chickens (*Gallus Gallus*) are the most common species in Africa and South Africa's rural poultry industry. Male farmers are primarily in charge of cattle, sheep, and goats, while female farmers are in charge of pigs and poultry production.

Ethiopia has a large chicken population, estimated at 48.89 million, with non-descriptive breed chickens, hybrid chickens, and exotic breed chickens primarily kept in urban and peri-urban areas, accounting for 96.6 percent, 0.55 percent, and 2.8 percent, respectively. In Ethiopia, 99 percent of the chicken population is raised using the traditional back yard management system, while 1% is raised using the intensive management system

(Tadelle, 2003). Furthermore, in many parts of the modern world, poultry is regarded as the primary source of not only low-cost animal protein but also high-quality human food (Jordal, 2002). In Ethiopia, three types of poultry production systems have been identified (Yami, 1997). Backyard poultry production systems, small-scale intensive poultry production systems, and large-scale intensive poultry production systems are all examples. In all production systems, the primary goal of chicken rearing is to produce eggs and meat for income and domestic consumption (Nasser, 1998).

Animal production in developing countries is under intense pressure to meet the demand for animal protein resulting from the continued rise in human population, as well as to have surpluses for international trade (FAO, 1993). Among the animal production activities, the poultry sector is the fastest growing. As a result, the production of poultry protein products has increased significantly.

In many of these countries, it has recently expanded. Nonetheless, a number of constraints have had a negative impact. Among the constraints, poultry diseases continue to be a major stumbling block to its growth (Rushton, 1999).

Coccidiosis is the most common parasitic disease among poultry infectious diseases. Poultry coccidiosis is a disease caused by the intracellular protozoa parasite *Eimeria* species of the genus *Eimeria*, family *Eimeridae*, order *Eucoccidiorida*, and phylum *Apicomplexa* in the genus *Eimeria* (Taylor, 2007). Coccidiosis is a disease caused by an infection with

enough coccidia to cause clinical symptoms (Conway D. a., 2007).

Despite the fact that nine *Eimeria* species have been identified as causative agents of poultry coccidiosis, only seven have been reported to be pathogenic (Kahn C., 2008).

Despite advances in prevention and control through chemotherapy, management, and nutrition, coccidiosis remains one of the most serious disease problems in poultry (Graat, 1996).

Animal production in developing countries is under intense pressure to meet the demand for animal protein resulting from the continued rise in human population, as well as to have surpluses for international trade (FAO, 1993). Among the animal production activities, the poultry sector is the fastest growing. As a result, recent years have seen a significant increase in the production of poultry protein products in many of these countries. Nonetheless, a number of constraints have had a negative impact. Among the constraints, poultry diseases continue to be a major stumbling block to its growth (Rushton, 1999).

This paper was based on secondary data from library research, as well as a review of relevant literature such as textbooks and journals. Chickens kept in overcrowded and confined areas are more likely to contract coccidiosis. Furthermore, it leads to the failure of poultry production as well as economic and social consequences. The poultry industry is one of the world's major sources of protein, but it faces numerous challenges, including coccidiosis, one of the diseases that has the greatest impact on productivity.

The Over-all objectives of the article were as follows: -

- To determine the prevalence of poultry Coccidiosis in Mogadishu-Somalia.
- To find out the risk factors associated with poultry coccidiosis in Mogadishu-Somalia.

Therefore, in this article as the authors we need to tackle all these problems, we need to have baseline information about the level of the disease based on its prevalence and also what factors are facilitating its existence and propagation. Only after then we can apply the correct measures for this disease.

## II. METHODOLOGY

The paper used cross-sectional study was conducted from September 2021 to February 2022 to determine the prevalence and to assess the risk factors of coccidiosis in chickens from farms and households in Benadir region, Mogadishu-Somalia.

The study populations were comprised of

randomly selected chickens in Mogadishu city. A total of 384 fecal samples were collected and examined for coccidia species from farms and households to estimate the prevalence and risk factors of poultry coccidiosis. Farms and households were selected purposively based on the higher chicken populations of the area to the age, sex, body condition, management, and housing type of chickens were gathered by short interview of owners. The study chickens were grouped into sex (male and female), age classified as young (less than or equal to 2 months) and adult (older than 2 months), management (intensive and extensive), body condition (poor, medium, and good), and housing method (floor and cage).

Sample size required for the study was determined using the formula given by Thrusfield (Thrusfield M., 2005). To calculate the sample size, 50% prevalence, 95% Confidence level, 50% expected prevalence and 5 % of desired absolute precision (d=0.05) was used.

$$n = \frac{(z)^2 p_{exp}(1 - p_{exp})}{d^2} = \frac{(1.96)^2 0.5(1 - 0.5)}{(0.05)^2}$$

Where, n=required sample size, Pexp= expected prevalence, d<sup>2</sup>= desired absolute precision. Since no previous study was undertaken in the study area, the expected prevalence was considered to be 50%. Accordingly, with 5% absolute precision at 95% confidence level, the number of chickens required to determine the prevalence was calculated to be 384. Then, simple random sampling method was used to select the chickens from farms and households. Therefore 192 chickens from the intensive farm and 192 chickens from the household with the totally of 384 chickens.

A Fresh fecal sample about 3grams was collected by using a spatula from freshly voided faces and directly from the cloaca of selected chickens using spatula, and then the spatula was washed after each sample collection in order to avoid contamination. Each faecal sample was placed in a prelabeled bottle indicating the age (young and adult), sex (female and male), management (intensive and extensive) body condition (poor, medium, and good), and housing method (floor and cage) and then were transported to Somali National University (SNU) Laboratory for fecal examination. The samples were immediately be stored in the refrigerator at 4°C until processed.

**Number of chickens in intensive farm/household and no. of the collected samples.**

Farm/Household	Number of Poultry	Number of examined
Poultry Farm	25,000	192
Small holder	450	192
<b>Total</b>	<b>25,450</b>	<b>384</b>

The floatation technique was applied by using sodium chloride solution to harvest oocysts. Processed solution was poured through a tea strainer into a beaker then into test tubes. The test tubes was covered with a cover slip and allowed to stand for 20 minutes and then was removed and placed on a slide and examined at 10x and then 40x magnifications to identify the oocyst.

All collected raw data of the study by letters were entered to a Microsoft Excel database system and imported to be analyzed using SPSS Version 20. The

point prevalence was calculated for all data by dividing positive samples by total number of examined samples and multiplied by hundred. Many attribute data imported to the database system includes type of production system, age, sex, body condition and housing method. Chi square analysis was used to determinethe association of the disease with the risk factors. A p-value of less than 0.05 at 95% confidence interval was considered as statistically significant.

**Table 1: Overall prevalence of coccidiosis in poultry in benadir region**

Total number	Number Positive	%	Number Negative	%
384	76	19.8	308	80.2

In the current study a total of 384 of poultry managed under of Intensive and small holderpoultry farm of production system was examined for coccidiosis.

Out of which 76 were found to be positive for the presence of Eimeria Oocytes and an overall prevalence of 19.8% was found inthe current study.

**Table 2: Prevalence of coccidiosis in intensive farm and individual smallholder.**

Farm/Household	No of Poultry	No of Examined	Positive Number	%P
Poultry Farm	25,000	192	27	14
Smallholder	450	192	49	25.5

According to Table 2, A total of 384 samples were collected and investigated, 192 samples were collected from the farm managed under intensive system and the other 192 samples were collected from the household. Out of 192 chickens examined were collected

from the Intensive poultry farm, 27 (14%) of them was positive, whereas 192 chickens examined where collected from the household, 49 (25.5%) of them was positive for coccidia oocyte.

**Table 3: Prevalence of coccidiosis according to age.**

Age	No of Examined	No of Positive	Prevalence%	X <sup>2</sup>	P-value
Young	230	47	20.4	0.149	0.401
Adult	154	29	18.8		

According to Table 3, Out of 230 chickens examined were young age, 47(20.4%) of them were found positive, where as 154 chickens examined were adult age, 29(18.8%) of them were found positive for coccidia

oocyte, the difference between the two age groups was not statistically significance different in poultry coccidiosis, X<sup>2</sup> (1, N=384) = 0.149, P-value = 0.401.

**Table 4: Prevalence of coccidiosis according to sex**

Sex	No of Examined	No of Positive	Prevalence %	X <sup>2</sup>	P-value
Male	204	41	20	0.026	0.488
Female	180	35	19.4		

According to Table 4, Coccidiosis prevalence in male and female chickens were 20% and 19.4% respectively, a significant different was not observed between the prevalence of male and female chickens

diagnosed, X<sup>2</sup> (1, N=384) = 0.026, P-value=0.488. Female chickens were found to have a slightly higher prevalence compared to male chickens.

**Table 5: Prevalence of chicken coccidiosis according to management system.**

Management	No of examined	No of positive	Prevalence %	X <sup>2</sup>	P-value
Intensive	192	27	14	7.940	0.003
Extensive	192	49	25.5		

According to Table 5, the prevalence of coccidiosis in chickens managed under intensive and extensive production system was found to be 14% and 25.5% respectively. Significance difference in prevalence of coccidiosis infection was observed between chickens

managed under intensive and extensive production system of the study X<sup>2</sup> (1, N=384) = 7.940, P=0.003 Extensive production system was found to have a higher prevalence of coccidiosis compared to those managed under intensive production system.

**Table 6: prevalence of Poultry coccidiosis according to housing method**

Housing Method	No of Examined	No of Positive	Prevalence %	X <sup>2</sup>	P-value
Cage	192	27	14	7.940	0.003
Floor	192	49	25.5		

According to Table 6, the prevalence of coccidiosis in chickens reared in floor and cage was 25.5% and 14% respectively. Statistically significant variation in the prevalence of coccidiosis was recorded

among chickens reared in floor and cage house  $X^2 (1, N=384) = 7.940, P=0.003$ . Slightly higher prevalence in floor house chickens than cage house.

**Table 7: Prevalence of coccidiosis according to body condition score**

Body Condition	No of Examined	No of Positive	Prevalence %	$X^2$	P-value
Good	80	7	8.8	12.665	0.002
Middle	112	18	16		
Poor	192	51	26.6		

According to table 7, the body condition score was categorized as good, middle and poor and its prevalence was 8.8%, 16%, and 26.6% respectively. Statistically significant difference in the prevalence of chicken coccidiosis was recorded  $X^2 (2, N = 384) = 12.665, P=0.002$ , higher in poor body condition chickens than middle and good body condition

### III. CONCLUSION

The result of the current study showed poultry coccidiosis is the most common encountered and important disease affecting chicken production in benadir region with an overall prevalence of 19.8%. The prevalence of coccidiosis was found low in intensive farm than in smallholder poultry farm.

The study confirmed the presence of significance association between the prevalence of chicken coccidiosis and several risk factors like management system, body condition score and housing method, where as those under extensive system, poor body condition score and floor house method all showed higher prevalence. On the other hand, the prevalence of coccidian has no significant association with the age and sex of chickens examined during the study period.

The prevalence of coccidiosis was found low in poultry farms that practice high standard hygiene. High burden of coccidian infection was recorded in farms that were careless in observing adequate hygienic measures. Different putative risk factors have contributed for the occurrence of poultry coccidiosis infection in the study sites. Among these body conditions and management system including a housing system and lack of effective biosecurity are the most common factors that contribute for the occurrence of coccidiosis. Therefore, biosecurity practices should be a primary focus in the prevention and control of coccidiosis. In addition, further studies needs to be conducted to identify the prevalent Eimeria species for strategic control.

### RECOMMENDATION

- Efforts towards educating the smallholder poultry farms and intensive farm to prevent and control coccidiosis through good management practice and proper use of anti- coccidial drugs should be considered and the coccidian infection should be kept on the outside. Disinfection of shoes before entering the chicken house is crucial.
- Further epidemiological investigation on coccidian is needed to investigate more the effect of other risk factors such as season and fecal consistency and breed and to determine the most common species of Eimeria affect the chickens.
- Since the study is higher prevalence in smallholder than intensive farm, its necessary to maintain good hygiene and sanitation. The following points should be considered to maintain good hygiene and sanitation: -
  - Keep older chickens away from young (chick), since old birds are carrier.
  - Avoid over-crowding, leaking water troughs and faeces accumulation.
  - Proper disposal of litters and avoid wetting of litters from leaking pipes to reduce the sporulation of the oocyte.
  - Separate the infected chickens from healthy ones.
- To control this important parasitic disease of poultry, further studies are needed to undertake a devise sustainable cost-effective prevention and control strategies.

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