Original Research Article

Rate of Coccidiosisin Chicken farms in UyoMetropolis, Akwa Ibom State, Nigeria

Abstract

Despite large number of chickens in Nigeria, contribution to national economy or benefit from this sector of activity is very limited due to diseases and management, out of which chicken coccidiosis is a leading problem. Coccidiosis is a major problem in the farm with inadequate hygienic measures and factors such as age, sex and biosecurity which are the most common factors that contribute for the occurrence of coccidiosis. This study was conducted to investigate the prevalence and incidence of coccidiosis in chicken farms in Uyo metropolis, Akwa Ibom State, Nigeria. Selected numbers of chicken farms within Uyo metropolis were used for this study. A total of 100 faecal samples from live birds comprising 62 young and 38 adult birds were randomly collected as bird's fresh droppings from both young and adult sections of the farm. Samples were analyzed using standard parasitological methods and techniques. An overall prevalence rate of 46%% was obtained. Higher prevalence rates were recorded in young bird as 48.38% while adult had 42.10%. Then five species of *Eimeria* that were identified include *E. tennela, E. maxima, E. necatrix, E. alervuhina*and *E. brunette* at 28%, 25%, 15.6%, 18.8% and 12.5% respectively. . . Therefore, appropriatecontrol strategies should be designed considering important risk factors and focus should be given to biosecurity practices inthe prevention and control of coccidiosis.In addition, further studies are needed to be conducted to identify the prevalent*Eimeria* species for strategic control.

Keywords: Incidence, Coccidiosis, Chicken Farms, Uyo, Akwa Ibom State, Nigeria.

1.1 Introduction

In Agriculture, chicken has a wide distribution within and withoout of Africa. Among members of the chicken family, fowl or chicken is the most common with approximately 98% of the total chicken population in Africa (UNDESA, 2017). "Over the decades, the world has been experiencing a continuous growth in human population. The current human population of 7.6 billion has been projected to a population of 9.8 and 11.2 billion respectively by 2050 and 2100" (UN DESA (2017). "To meet this ever-growing population, food, shelter and clothing become imperative. Food production carries a larger percentage of these basic human needs as its availability determines the existence of human population" (Erb*et al.*, 2012). In view of this, demand has been on the agricultural sector of each nation to increase food production that is safe for human consumption that will meet the ever-growing population.

"Poultry industry is one of the fastest growing sub-sectors of agriculture that contributes to global nutrition" (Mottet and Tempio 2017) and thus "a major driving force of the economy. Poultry, a major poultry bird contributes greatly to agricultural production through the supply of meat and eggs" (Hald, 2010). "However, poultrys are also host to many deadly diseases which hamper on productivity and compromise welfare resulting in high mortality in some cases. Among many diseases that affect poultrys globally, coccidiosis is a house-hold name associated with high level of mortality in poultry industry" (Blake and Tomley 2014).

"Poultry play a vital role through their contribution to the socio-economic and cultural lives of small-holder farmers" (Nyoni and Masika 2012). "Village poultrys can be used as tokens of appreciation for services rendered and are often given to visitors as gifts" (Kusina and Kusina1999). "Their role in national economies is through improved nutritional status and income of many small-holder farmers as well as landless and marginalized communities" (Tarwireyi and Fanadzo 2013).

Gallus gallus(Linnaeus, 1758) commonly called domestic fowl or poultry is reared by urban and rural farmers who use their eggs and meat as a source of animal protein and farm manure (Frantovo 2000). "The greatest impediment to poultry production in Nigeria is diseases" (Lawal *et al.*, 2001). "Parasites can be a significant factor limiting the productivity of poultrys by affecting the growth rate of poultrys and causes organ damage and eventually death" (Negbenebor and Ali, 2018). "The *Gallus domesticus* can easily be infested with several types of bacterial, viral, fungal and parasitic pathogen" (Tarwireyi and Fanadzo, 2013). "Parasites are among the infectious agents that cause an alarming problem to the industry, posing adverse economic effects. Gastrointestinal parasitism leads to significant economic losses in poultry" (Aklilu, 2007).

"The parasite colonizes and infect the intestinal tract of different animals and birds" (Haug*et al.,* 2008) and "the infection is been established through ingestion of feed or water contaminated with sporulated oocycts" (Allen and Fetterer, 2002). "Infection with this parasite is characterized by dysentery, enteritis, which may bloody with certain *Eimeria*species, lower feed intake, interference with normal digestion and nutrient absorption, emaciation, dropping wings, and delayed sexual maturation" (Rehman *et al.*, 2010; Awais*et al.*, 2012).

"Poultry coccidiosis, caused by the protozoan parasite of the genus *Eimeria*, remains one of the most important parasitic diseases in poultry industry worldwide" (Bera*et al.,* 2011; Jadhav *et al.*, 2011). "Several studies established the prevalence and economic importance of coccidiosis as a major parasitic disease in both local and exotic breeds of poultry worldwide" (Dakpogan and Salifou, 2013) The prevalence of coccidiosis was reported in many countries such as Iran (Nematollahi*et al.*, 2009), Egypt (Ahmed *et al.*, 2012), Ethiopia (Oljira*et al.*, 2012), India (Sharma *et al.*, 2015); South Africa (Mwale and Masika, 2011) and Nigeria (Musa *et al.*, 2010; Jatau*et al.*, 2012).

These pathogenicity of these species in chicken have caused huge damage and great economic loss to the agricultural industry due to mismanagement (Jones and Prescott,2020). Including ratio, weight loss, decreased feed conversion, low egg production and death in young birds as a result of damage intestine (Balqis, 2013). Primarily, farmers have been forced to either keep the business or hold or completely out of business as a result of high mortality. Chicken mismanagement is one of the major causes for the prevalence of parasitic infections. This resulted to 64% infection rate of 300 chickens in Uyo metropolis (Usip*et al.*, 2017). Therefore, it is important to understand the current rate of prevalence of coccidiosis, thereby developing new or improving already existing methods of prevention, control and treatments in chicken farms in Uyo. This study will provide resourceful information in regards the coccidia species and site of infestation in the local fowl. Additionally, it is pertinent for prompt disease diagnosis for further actions.The main objective of this study is to investigate the prevalence and incidence of coccidiosis in chicken farms in Uyo metropolis, Akwa Ibom State, Nigeria.

2.0 Materials and Methods

2.1. Study Area

The study was conducted in Uyo, Akwa Ibom State Uyo metropolis. Uyo is the capital of Akwa Ibom State, in the South South region of Nigeria which stands at a total area of about 140sq miles. It lies approximately between latitude 5^{o} 2' 51 North and Longitude 8^{o} 2' 41 East. The climate condition of the study area is characterized by both rainy and dry seasons, which ranges between March to October and November to February respectively. The annual rainfall is about 2500 m with a mean annual temperature of 32 ^{o}C and a relative humidity of about 75%.

2.2. Sample collection

Ten chicken farms were visited for specimen collection. Fresh faecal droppings and carcasses were collected in well labelled sterile universal bottles and polythene leather bags respectively and were transported to the Department of Animal and Environmental Biology, Faculty of Biological Sciences, University of Uyo Laboratory for further processes.

One hundred (100) (intestinal gut samples) taken from chicken that obtained from different chicken farms and were collected in well labelled sterile universal bottles and polythene leather bags respectively and were inside a plastics container filled with ice to keep the samples fresh and was transported to the Department of Animal and Environmental Biology, Faculty of Biological Sciences, University of Uyo Laboratory for further processes. "After birds' necropsy, the intestine of each bird was dissected out; divided into small intestine and large intestine, then evacuated and scrabed separately into respectively labeled plastic cups, sieved, and preserved using potassium dichromate 2.5 % (in ratio of 1:3) and neutral buffer formaline 10%. Muciod specimens were mixed with several drops of 1% of KOH to avoid trapping of protozoan oocysts during sieving" (Garcia, 2001).

2.3. Gross examination

Intestinal wall, mucosa and serosa were examined for thickening, other pathological changes as haemorrhage, congestion, corregations, tissue debris white spots, and ulceration. Also, blood and abnormal content were examined if present within the intestinal contents grossly (Garcia, 2001).

2.4. Parasitological examination:

a. Direct examination: through

1. Unstained wet mount technique (Garcia, 2001): a drop of the scraped intestinal mucosa put on clean slide and mixed with a drop of 0.9% saline, thoroughly mixed till forming uniform smear. For detection of any coccidian oocysts

2. Concentration technique:"Positive *Eimeria spp*. samples were concentrated using saturated salt floatation concentration technique according to" (Cringoli*et al.*, 2010).

b) Sporulation of coccidian oocysts according to (Rao *et al.*, 2013)

For perfect identification, the coccidian oocysts were sporulated. In clean glass petri dishes, the positive faecal samples for *Eimeria species* were mixed with 2.5% potassium dichromate solution at the depth of 3-5 mm. Petri dishes. The covers of the petri-dishes were lined by moist filter paper and left to stand at room temperature. They were daily aerated and

examined to follow up the process of sporulation. The contents of these petri-dishes were concentrated by floatation technique, for identification of the morphological characters of sporulated *Eimeria*oocysts.

2.5. Statistical analysis

The collected data were analyzed by Statistical Package for Social Sciences v.20 for Windows (SPSS). The significance of differences between the groups were calculated using the Chi-square test for trend analysis (p-value of < 0.001 considered significant).

3.0. Results

3.1. Prevalence of Coccidiosis infection from chicken farms in Uyo L.G.A.

Out of the one hundred and twenty specimens collected, that isone hundred faecal droppings and twenty carcasses, 45 faecal droppings were positive for oocysts of coccidiosis and 6 carcasses were positive of different species of *Eimeria*. Infection rate was higher among the younger birds (Table 1). Number of faecal samples examined in Farm A, B, C, D, E, F, G and J were 11, 16, 10, 12, 11, 9, 6, 8, 10 and 7 respectively. In Farm A-J, the numbers of young sample examined were more than the adult except Farm G that recorded same (3 each). For Farm A, B, C, D, E, F, G and J, the prevalence of infection in young and adult were 50.0 % and 33.3%, 50.0% and 50.0%, 57.1% and 67.0%, 38.0% and 25.0%, 50.0% and 40.0%, 80.0% and 25.0%, 33.3% and 33.3%, 40.0 and 67.0%, 50.0% and 25.0%, and 25.0% and 67.0% respectively.

Table 1: the prevalence of coccidiosis infection from chicken farms in Uyo L.G.A.

Farms	No. of faecal droppings examined	Age		Prevalence of infection according to Age	
		Young	Adult	Young (%)	Adult (%)
A	11	8	3	4 (6.45)	1 (2.63)
B	16	10	6	5 (8.10)	3 (7.89)
C	10	7	3	4 (6.45)	2 (5.26)
D	12	8	4	3 (4.83)	1 (2.63)
E	11	6	5	3 (4.83)	2 (5.26)
F	9	5	4	4 (6.45)	1 (2.63)
G	6	3	3	1 (1.61)	1 (2.63)
H	8	5	3	2 (3.22)	2 (5.26)
I	10	6	4	3 (4.83)	1 (2.63)
J	7	4	3	1 (1.61)	2 (5.26)
Total	**100**	**62**	**38**	**30 (48.38)**	**16 (42.10)**
Total Prevalence				**46 (46%)**	

Significant at $p \leq 0.05$; $X^2=14.54$

Chi-square for was used to compare young and adult infection of infected birds.

Significant difference between young and adult infection of infected birds($P< 0.05$).

Table 2: the different *Eimeria* species identified in this study

Farms	No. of Carcasses	*E. tennela* (%)	*E. maxima* (%)	*E. necatrix* (%)	*E. alervuhina* (%)	*E. brunette* (%)	Total

A	4	2	1	0	2	1	6
B	2	1	1	2	0	0	4
C	2	1	0	0	1	1	3
D	1	0	1	0	1	0	2
E	0	0	0	0	0	0	0
F	3	2	1	1	0	1	5
G	2	1	1	1	1	0	4
H	2	1	1	1	0	0	3
I	1	0	0	0	0	1	1
J	3	1	2	0	1	0	4
Total	**20**	**9 (28)**	**8 (25)**	**5 (15.6)**	**6 (18.8)**	**4 (12.5)**	**32**

Significant at $p \leq 0.05$; $X^2 = 10.72$

Chi-square for was used to compare the prevalence of the different *Eimeria* species.

Significant difference between young and adult infection of infected birds ($P < 0.05$).

3.2. Different *Eimeria* species identified and their percentage intensity

Table 2 reveals 5 species of *Eimeria* to be prevalent in the 10 farms under study. They include *E. tennela, E. maxima, E. necatrix, E. alervuhina*and *E. brunette*. For the carcasses used for the analysis, farm E recorded 0, thus no presence of parasite. Farm A recorded the highest number of carcasses (4) with all species present except *E. necatrix.* Farm F and J recorded 3, with all species present except *E. alervuhina*and *E. necatrix*and *E. brunette* respectively. Farm B, C, G and H recorded 2, with all species present except *E. alervuhina and E. brunette, E. maxima* and *E. necatrix, E. brunette* and *E. alervuhina* and *E. brunette* respectively. The highest and lowest prevalence of coccidiosis were *E. tenella* and *E. brunette*.

3.0. Discussion, Conclusion and Recommendations

3.1. Discussion

Epidemiological studies on the prevalence and intensity of *Eimeria* species are useful tools for the prevention and control of coccidiosis and specifically in Nigeria (Ola-Fadunsin and Ademola 2013). It has been reported from consistent literatures that coccidiosis is the most common parasitic disease of chicken and also a major constraint to the success of chicken farming in Nigeria (Lawal *et al.,* 2016).

The prevalence of coccidiosis in this study revealed*E. tennela* (28%), *E. maxima* (25%), *E. necatrix*(15.6%), *E. alervuhina* (18.8%) and *E. brunette* (12.5%) in both young and adult chickensampled in 10 different farms in Uyo, Akwa Ibom State, Nigeria and were significantly different at $p<0.05$.

A total of 100 droppings of chickenwas observed. The prevalence of coccidiosis in this research was 46% which corroborates with previous reports of Lucas and Zainab (2016) in Gombe that reported 42.7%, Agishi*et al.,* (2016) that reported 40.1% at Slaughter Houses in Makurdi, Benue State, Usman *et al.,* (2022) in Bauchi that reported 43.3%. Generally, the variation in the prevalence in coccidiosis in chicken is likely attributed to a range of factors which includes sampling periods (rainy or dry), sample size (number of concerned samples,

geographical area (tropical or temperate) and climatic conditions observed in different study areas. It should be borne in mind however, that incidence of coccidiosis is high in highly humid geographical areas like (Akwa Ibom State, Nigeria) explaining the higher prevalence reported in these parts of Nigeria. The relatively high prevalence reported in this work could also be due to poor management practices in the farms. One of these practices as observed by the researcher's during sampling is the perpetual spillage of water on the litters from the chicken drinkers, which encourages *Eimeria*build-up and subsequent sporulation and infection. This is consistent with the reports by Taylor *et al.* (2007) and Omer *et al.,* (2011). It is reported that most livestock farmers are not expert and do not seek professional advices and consultation (Okon*et al.,* 2020; Silas *et al.,* 2024).

However, the prevalence of this result was higher than the prevalence of coccidiosis in chicken farm in Maiduguri (Jallailudeen*et al.,* 2016), Eke *et al.,* (2016), Lawal *et al.*,(2016) and Dechas*et al.,* (2023) who reported low (28%, 37.1% and 27.1 respectively) prevalence.

The prevalence of the disease in farms in Uyo metropolis might be attributed to poor sanitation practices and unhygienic environmental conditions which encourages and pampers the survival of oocyts. Five species of *Eimeria*were identified in the present study, *Eimeriatenella*9 (28%),*E. maxima 8* (25%), *Eimerianecatrix*5 (15.6%), *Eimeriaacervulina*6 (18.8%) and *E. brunette* 4 (12.5%).

All these species have been identified in literatures of Haug*et al.,* (2008); Amer *et al.,* (2010); Hadipour*et al.,* (2011); Jatau*et al.,*(2012); Hadipour*et al.,* (2013); Meskerem*et al.,* (2013); Olanrewaju and Agbor (2014);Kaboudi*et al.,* (2016); Agishi*et al.,* (2016) and Dechas*et al.,* (2023). These reports have recorded at least 3 of the *Eimeria* species which have been identified and recognized chicken in this study. The coccidian parasite, *Eimeria*has special preferences to the chicken's intestinal tract with predilection in different anatomical sites of the tract, thus its prevalence in chicken. It is associated with bloody diarrhea, low productivity due to low feed conversion rates (production losses), reduced welfare of birds and increased mortality resulting from the extensive damage of the gastrointestinal tracts.

The young samples reported higher prevalence than the adult at 48.38% and 42.10% respectively. This study was similar to report recorded by Hembram*et al.,* (2015); Sheikh *et al.* (2016); Lawal *et al.,* 2016);Bandi*et al.,* (2020);Zalizar*et al.,* (2021); Oriaku*et al.,* (2024), who reported the prevalence of coccidiosis to be higher in young than adult chicken. Oriaku*et al.,* (2024) added that high rate of infection in young birds may be due to decreased immunity as well as continuous exposure to infections from the contaminated litter.

Amongst all species of prevalence, *E. tennela* and *E. maxima* had the highest at 28% and 25% respectively. This was in conformity with a study in Bauchi that reported most prevalent of coccidiosis in chicken to be *E. tennela*at 29.1% (Auwal*et al.,* 2022), but recorded *E. maxima* as the least with 5.8% (Auwal*et al.,* 2022; Abdullahi *et al.,* 2023). This result does not agree with Abdullahi *et al.,* (2023) who reported 7.84% and 6.86 for *E. tennela* and *E. maxima* respectively. Lawal *et al.* (2016) in Maiduguri also reported four species of *Eimeria*except for *E. brunetti.* Jatau*et al.* (2012) in his work carried out in Zaria, Nigeria reported about seven species. Muhammad *et al.* (2011) in Iran and Bachaya*et al.* (2015) in Pakistan all reported four *Eimeria*n species except *E. brunetti*which suggests that those species of *Eimeria*are widely distributed in many countries.

The *Eimeria*n species identified in this study are considered to be among the most economical important parasitic species of chicken. Jatau*et al.* (2012) reported that in Nigeria,

coccidiosis is caused by *E. tenella, E. necatrix, E. acervulina, E. mitis, E. brunneti,* and *E. praecox.* The identification of *E. tenella and E. necatrix*in this study agrees with Abdullahi *et al.,* (2023) who reported that they are the two most pathogenic species of *Eimeria.* Although in this study, *E. brunette* had the lowest prevalence of 12.5%.

5.3. Conclusion

Coccidiosis is a serious parasite illness that affects chickens and causes large financial losses for chicken farmers all over the world. Numerous Eimeria species have been shown to have varied degrees of pathogenicity when it comes to affecting chickens. The occurrence of coccidiosis dependent on agent, host and management as well as environment associated risk factors. Given that 46% of the sampled farms have Eimeria, this study has demonstrated that the disease is endemic among poultry in Uyo, Akwa Ibom State, Nigeria. When combined with histology, the presence of lesions and damaged intestinal tissue may aid in a more accurate diagnosis of coccidiosis. Coccidiosis in domestic hens can be prevented and controlled with the use of anticoccidials and proper management.

5.4. Recommendations

Based on above findings and conclusion, farmers are advised to carryout good biosecurity measures such aproper stocking density, keeping litter dry by repairing all leaking watering trough, appropriate use of anticoccidial drugs prescribed by registered veterinarians, daily cleaning of litters to avoid accumulation of feaces which help in oocysts development, proper prophylactics treatment and management to decrease the impact of coccidiosis on the economy of developing country.These measures when practiced will be effective in reducing the losses induced by the disease. In addition, to control this economically important parasitic disease of chicken, further studies need to be undertaken to come up with sustainable and cost-effective prevention and control methods.

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Details of the AI usage are given below:

1. AI was used to paraphrase terms
2. AI was only used to checkmate grammars

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