



Coccidiosis among Local and Exotic Breed of Chickens Reared in Biu Local Government Area of Borno State, Nigeria

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Abstract

A cross-sectional study was conducted from September to November, 2022 with the aimed of determining the prevalence and species of *Eimeria* in both local and exotic breeds on chickens reared as well as the associated risk factors within Biu Local Government Area, Borno State. Three hundred and eighty-four (384) faecal samples were collected and examined using centrifugal flotation techniques for coccidian oocysts. Chi-square and simple percentage were used to analyze the data and $p < 0.05$ to determine the level of significance. An overall prevalence of 238(62.0%) was observed. Biu town had the highest prevalence rate of 119(73.9%) followed by Buratai, 73(50.0%) and then Miringa, 46(59.7%). The prevalence rate was high in young chicken groups (1-4 weeks) 80.0% followed by (5-15 weeks) 64.0% and (16 and > weeks) 49.2% as well as higher in female chickens 64.9% than males 57.1%. The difference in prevalence rate between locations, age groups and sexes of the chickens were not statistically significant ($p < 0.05$). Intensively managed farms had the highest prevalence rate 70.8% than extensive managed farm 45.5% and high prevalence rate was observed in chickens with bad body condition 78.3% than chicken with good body condition 50.7%. Exotic breeds had highest prevalence rate 70.0% than local breeds 46.8%. The difference in prevalence rate based on management systems, body condition and breed of the chickens were statistically significant ($p > 0.05$). Six different species of *Eimeria* was encountered *Eimeria mitis* had the highest prevalence rate of 65(24.6%) followed by *Eimeria praecox* 52(19.7%), *Eimeria tenella* 42(15.9%), *Eimeria necatrix* 31(11.7%), *Eimeria maxima* 31(11.7%) and *Eimeria acervulina* had the least of 14(5.3%). Coccidiosis is endemic in the study area. Therefore, it is recommended that good management system, routine sanitations and hygiene practices, use of anti-coccidial drugs regularly and vaccinations as well as creating awareness among farmers on the effect of Coccidiosis on their chickens and their welfare will help in achieving a significant development on their productivity in the study area.

Keywords: Coccidiosis, *Eimeria* local and exotic breed, Biu, Poultry

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Introduction

The poultry industry in Nigeria has witnessed expansion in recent times and the estimated poultry population in Nigeria was over 150 million in 2006 (FAO, 2006). Poultry production has developed from backyard business to a commercially oriented industry. Its offer of highest turnover rate and quick

returns to investment outlay in the livestock enterprises has made it unique (Adeyemo and Onikoyi, 2012). In FDLPC, (2004) reported that Nigeria produced 2 billion eggs, 12,000 tonnes of poultry meat, while estimated poultry meat consumption per capital was 1.3 Kilograms (Okaiyeto and Adamu, 2004). Poultry, which is next to ruminant as a source

of protein in Nigeria, accounts for almost 25% of local meat production (Nwagu, 2002). High rate of disease and pest attack as a major challenge in poultry production was reported by Ajala *et al.* (2007) and Aromolaran *et al.* (2013).

Coccidiosis is a disease caused by protozoan parasites of the genus *Eimeria* and the disease affect a wide range of animals especially birds. Out of the nine species of *Eimeria* that have been identified and recognized in domesticated chickens *E. brunette*, *E. maxima*, *E. necatrix* and *E. tenella* considered to be the most pathogenic, *E. acervulina*, *E. mitis*, *E. mivati* considered to be less pathogenic while *E. praecox* and *E. hagani* are known to be less or non-pathogenic species (Haug *et al.*, 2008; Amer *et al.*, 2010). All avian *Eimeria* with the exception of *E. dispersia* infects only one poultry specie (Poultry World, 2022). *E. dispersia* may infect and cause disease in turkeys, quail and pheasants. The *Eimeria* oocyst contains four sporocysts. The symptom of the disease includes watery or bloody diarrhea, depression, weight loss, paleness, ruffled feather, huddling, unwillingness. Coccidiosis is widely recognized as a significant barrier to poultry production characterized by high morbidity, mortality and heavy economic setbacks worldwide.

Coccidiosis is one of the most devastating diseases with a substantial economic impact on poultry production. Several reports on the prevalence of coccidiosis in some States across Nigeria have been documented such as Lucas and Zainab (2016) in Gombe and Usman *et al.* (2022) in Azare Metropolis, Bauchi State. However, there is no published data on the overall prevalence of this disease in the Study Area. The study aims to determine the prevalence and species of *Eimeria* in both local and exotic breeds in chickens reared within the Study Area. This will serve as useful knowledge in formulating effective control strategies for coccidian infection, steering to a significant development in the productivity of chicker in the area.

Materials and Methods

Study Area

Biu is a Local Government area in the Southern Senatorial Zone of Borno State is located between latitude 10° 36' 46.26" N and longitude 12° 11' 40.49" E with an elevation of 762.32 meters (2501.05 feet) above sea level, and occupies a total land mass of 3,423.86 Km² representing 4.51% of total land mass of the State and 0.37% of the entire country (NPC, 2006). The area inhabits a total human population of 176,072 in accordance to the 2006 census. Majority of the people are Babur and Bura, others include Margin, Tera, Mina, Fulani. The economic activities in the area include Agriculture (cowpea, sorghum, millet, maize, beans and cotton), animal husbandry (cattle, sheep, goat, poultry, horse, etc), trading and mining (iron ore, feldspar, topaz, etc). The area falls within both the Northern Guinea Savannah and the Sudan Savannah regions with a characteristic of semi-arid and average temperature of 32°C Kparmwang, *et al.* (1994); Amaza *et al.* (2007).

Sampling method

A random probability sampling method was employed, where individual samples were selected at random, hence, each member of the population had an equal chance or probability of being selected. A transverse analysis or prevalent study was carried out from the period of September to November, 2022 to examine the prevalence rate of coccidiosis among the local and exotic breeds of chickens reared in Biu Local Government Area of Borno State. Chicken owners were asked on breed, sex, age and type of management system while body condition was determined based on their physical appearance.

Sample Collection

Fresh fecal drops from chickens was collected in a sterile Ziplock bag with information regarding age (1-5weeks, 6-15weeks and 16weeks & above), breed (local and exotic), sex (male and female), body condition (good and bad) and management type (intensive and extensive) from three developmental areas representing Biu local government (Biu town, Buratai and Mringa).

The sample was then transported immediately to the Biology Laboratory of the Nigerian Army University Biu in an icepack for analysis.

Sample Size Determination

The sample size was determined using a standard sample size determination formula recommended by Getachew *et al.* (2017) a constant z-score value of 1.96, for 95% confidence level was used

$$\text{Sample size} = \frac{(z\text{-score})^2 \times \text{standard Deviation} \times (1 - \text{standard Deviation})}{(\text{confidence interval})^2}$$

Sample size = 384

Laboratory Analysis

Preparation of Flootation Solution

The flotation solution used was Sodium chloride solution and was prepared using a standard procedure described by (Krishi, 2015).

Fecal Analysis

Fecal samples were analyzed in the laboratory using the centrifugal fecal flotation techniques as described by Filipe *et al.* (2022). 2g of faeces was weighted and transferred into 250ml glass beaker then, 4ml of flotation solution was added and mixed thoroughly with faeces. Another 4ml of flotation solution was added and mixed thoroughly again, then filtered the preparation through a tea strainer into another beaker and poured it into a 15ml test-tube supported in a test tube rack. Flotation solution was added in to the test tube until a slightly positive meniscus forms. A coverslip was then placed on the top of the test tube and allowed it to stand for 10-15 minutes after which it was lifted with a drop of fluid adhered to the bottom of it and placed it on a microscope slide. Examined the slide under a light microscope at low power (10x) and at high power (40x) for oocyst identification. *Eimeria* Species were identified based on the identification key described by McDougald (2003).

Statistical Analysis

Data collected were subjected to Chi-square test to compare the relationships between variables and a simple percentage to determine the prevalence rate. All data were analyzed in Microsoft Office Excel Version 2010. $p < 0.05$ was used to determine the level of significance

Results

Out of 384 samples collected and examined, two hundred and thirty-eight 238(62.0%) were positive for Coccidiosis. Biu town had the highest Prevalence rate of one hundred and nineteen 119(73.9%) followed by Buratai and then Miringa with 73(50.0%) and 46(59.7%) respectively, the infection in different locations within the study area was not statistically significant ($p > 0.05$) as shown in table 1. The prevalence rate recorded was relatively high in young group (1-4 weeks) 92(80.0%) followed by (5-15 weeks) and (16 and > weeks) with 57(64.0%) and 89(49.2%) respectively. Similarly, the prevalence was higher in exotic breeds 180(70.0%) than local breeds with 58(46.8%) and in females 157(64.9%) than males with 81(57.1%). Furthermore, in terms of management system, chickens reared under intensive management had highest prevalence 177(70.8%) than those reared under extensive management 61(45.5%) while high prevalence was observed in chickens with bad body condition 123(78.3%) than those with good body condition 115(50.7%). The infection rate among different age groups, breed management system and body condition of the chickens reared in the study area were not statistically significant (Table 2).

Six different species of *Eimeria* were encountered during the study which included *Eimeria mitis* had the highest prevalence rate of 65(24.6%) followed by *Eimeria praecox*, *Eimeria tenella*, *Eimeria necatrix*, *Eimeria maxima* and *Eimeria acervulina* with 52(19.7%), 42(15.9%), 31(11.7%), 31(11.7%) and 14(5.3%) respectively (Table 3).

Table 1: Prevalence of Coccidiosis Based on Location in the Study Area

Coccidiosis among Local and Exotic Breed of Chickens Reared in Bui

Location	No. Examined	No. Infected	Prevalence (%)	P value
Bui town	161	119	73.9	
Buratai	146	73	50.0	
Miringa	77	46	59.7	6.03
Total	384	238	62.0	

Table 2: Factors Associated with Coccidiosis in the Study Area.

Risk Factor	No. Examined	No. Infected	Prevalence (%)	X ²	P Value
Breed					
Local	127	58	46.8	21.42	0.024
Exotic	257	180	70.0		
Sex					
Females	247	157	64.9	1.61	0.147
Males	142	81	57.1		
Age					
1-4 weeks	115	92	80.0		
5-15 weeks	88	57	64.0	9.82	4.381
16weeks and above	181	89	49.2		
Management System					
Intensive	250	177	70.8	23.65	0.019
Extensive	134	61	45.5		
Body Condition					
Good	227	115	50.7	30.18	0.008
Bad	157	123	78.3		

Table 3: Prevalence of *Eimeria* Species in the Study Area.

Identified Species	No. Infected	Prevalence (%)
<i>E. mitis</i>	65	24.6
<i>E. praecox</i>	52	19.7
<i>E. acervulina</i>	14	5.3
<i>E. necatrix</i>	31	11.7
<i>E. tenella</i>	42	15.9
<i>E. maxima</i>	31	11.7
Total	264	100

An overall prevalence of 62.0% was observed among local and exotic breed of chicken reared in the study area. This finding is higher to the previous findings of Usman *et al.* (2022) in Katagum Local Government Area of Bauchi State and Julailudeen *et al.* (2016) in Maiduguri who reported 43.3% and 31.8% respectively but lower than Ola-Fadunsin, (2017) who reported 97.9% on his study title Investigations on the Occurrence and Associated Risk Factors of Avian Coccidiosis in Osun State. The difference in prevalence rate in different area may be due to the different in rearing system, geographical location, chicken breed, proper hygiene practice as well as the proper use of anti-coccidial drugs on the chicken. Even within the study area, prevalence rate differs with Biu town had the highest of 73.9% followed by Miringa and Buratai with 59.7% and 50.0% respectively. The difference between different locations within the study area is statistically insignificant and is due to the different in management system practices which included over-crowding, different method or time of hygiene practice as well as choose of anti-coccidial drugs among others as observed during study. Six different species of *Eimeria* were encountered *Eimeria mitis*, *Eimeria praecox*, *Eimeria tenella*, *Eimeria necatrix*, *Eimeria maxima* and *Eimeria acervulina* during the study. All these species have been identified by other researchers in the neighboring states Usman *et al.* (2022) in Bauchi and Lucas and Zainab (2016) in Gombe. However, Amer *et al.* (2010) and Haug *et al.* (2008) reported nine species of *Eimeria* which have been identified and recognized in domesticated chickens. According to these authors, *E. brunette*, *E. maxima*, *E. necatrix* and *E. tenella* are reconsidered to be the most pathogenic, *E. acervulina*, *E. mitis* and *E. mivati* are less pathogenic while *E. praecox* and *E. hagani* are implicated to be less or non-pathogenic species.

Similarly, higher prevalence was observed in exotic breed than in local breeds in this study which corresponds with the results of Julailudeen *et al.* (2016). This may be attributed to difference in breed immunity,

higher stocking densities and poor hygiene practice which allows the chickens to ingest their faeces easily during the process of feeding. The local breeds in this study area were usually allowed to scavenge in a free and open environment. This may be the reason for low prevalence rate when compared with the exotic breed. The difference between the two breeds in terms of prevalence rate was statistically significant ($p < 0.05$). The prevalence rate in terms of sex of the chickens showed high prevalence among females 64.9% than males 57.1%. The difference between the sexes in prevalence rate was not statistically significant ($p > 0.05$). This might be because most layers amongst other females are isolated in a separate cage for egg production over long time. Although birds regardless of their sex, have an equal chance of been infected with *Eimeria* oocysts depending on the manner and level of exposure. This collaborates with previous studies of Nematollahi *et al.* (2009) and Usman *et al.* (2022).

Also, the finding of this study revealed high prevalence rate on young chickens group when compared to adults chickens group. This agreed with the report of Omer *et al.* (2011) and Ahmed *et al.* (2012) but disagrees with that of Etuk *et al.* (2004), whose report shows higher prevalence in adults than young chicks. The difference between the age groups in prevalence rate was not statistically significant ($p > 0.05$). Usman *et al.* (2022) associated the high prevalence with the undeveloped immune system in young chickens which leaves them susceptible to infection with *Eimeria* species. Similarly, high prevalence was recorded from the chickens raised in intensively managed system when compared with those raised in extensive managed system. The difference was statistically significant ($p < 0.05$) and could be due to poor sanitation and routine hygiene practices as well as higher stocking density as observed in the study area. This is in consonance with previous study of Julailudeen *et al.* (2016) which reported high prevalence rate among birds reared under intensive management system than extensive management system. Prevalence rate based

on body condition of the chickens was high 78.3% bad body condition than those with good body condition 50.7%. This finding aligns with the work of Anteneh *et al.* (2019), who reported higher prevalence rate on chickens with poor body condition than chicken with good body condition in his study at Gondar Town, Ethiopia.

In conclusion, coccidiosis is endemic in the study area. Therefore, it is recommended that good management system, routine sanitations, good hygiene practices, use of anti-coccidial drugs regularly and vaccinations as well as creating awareness among farmers on the effect of coccidiosis on their chickens and their welfare will help in achieving a significant development on their productivity in the area.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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