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Prevalence of *Eimeria* oocysts among broiler and layer flocks in selected poultry farms in Makurdi, Benue State, Nigeria

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ABSTRACT

Coccidiosis is an important enteric parasitic disease associated with significant economic losses to poultry farmers worldwide. This study evaluated the prevalence of coccidian infection in broilers and layers in Makurdi. A total of 228 fresh feacal samples were randomly collected from some selected farms in Makurdi and examined in the laboratory for the presence of Eimeria oocyst using simple floatation technique. The overall prevalence due to natural infection was 58.3%. Out of the 114 broilers and 114 layers sampled 62/114 (54.4%) broilers and 71/114 (62.3%) layers had Eimeria oocysts infection, respectively with layers having the highest prevalence. The age group prevalence showed that 1-4 weeks old broilers and 25-30 weeks layers had the highest prevalence. Significant differences in infection rate were seen in broilers ($p<0.05$) but no statistical difference was observed among ages of layer chickens and coccidiostat administration history. The study concludes that the parasite is endemic in Makurdi town and proper control measures with good biosecurity practices and prophylactic anticoccidial programs must be implemented to reduce economic loss to the poultry farmers.

***Key Words**: Coccidiosis, Eimeria oocysts, Prevalence, Broilers and Layers.*

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I. Introduction

Coccidiosis is the most common enteric parasitic disease of poultry and a significant constraint to successful poultry farming worldwide. The poultry industry is one of the fastest growing agricultural sub-sectors contributing to global nutrition (Mottet and Tempio 2017). Chicken, a major poultry bird contributes significantly to agricultural production through the supply of meat and eggs (Hald 2010). However, chickens are also host to many deadly diseases which hamper productivity and compromise welfare resulting in high mortality. Among many diseases affecting chickens globally, coccidiosis is a household name associated with high mortality in the poultry industry (Blake and Tomley, 2014). Chicken coccidiosis is an enteric disease that impairs growth and suppresses the immune system

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resulting in high mortality estimated to cost more than US$ 3 billion annually in the poultry industry (Blake and Tomley 2014). Farmers who are impacted with the disease suffer losses in the form of mortalities, decreased market value of the sick birds and occasionally culling or postponed slaughter. The main cause of coccidiosis is Eimeria oocyst, which chickens contract through ingestion of contaminated food, water and litter (Shivaramaiah et al., 2014). In chickens, seven species of Eimeria have been identified, among which *E. tenella*, *E. maxima* and *E. acervulina* have been regarded as the most economically significant species (Thenmozhi et al., 2014). Eimeria spp. can cause infection in all ages (Sharma et al., 2015). Due to the increased chance of high oocysts accumulation in the litters, poultry under intensive management systems such as deep litter typically exhibits high incidence of coccidiosis (Dakpogan et al., 2013). Oocysts sporulation is favored by damp litter with a high moisture content and temperature between 25-30^{o}C (David, 2000). The disease is endemic in tropical and subtropical regions where ecological and management conditions favor an all-year-round development and propagation of the causal agent (Obasi et al., 2006). The control measure against this parasite has been through anticoccidial drugs, vaccines and strict management practice (Godwin and Morgan 2015). However, the poultry industry is now faced with a new problem for coccidiosis prevention and control due to the increased occurrence of resistance against common anticoccidial medication. This has prompted the search for other techniques among which vaccination is crucial (Lee et al., 2010). There are currently few studies on the prevalence and risk factors associated with the occurrence of poultry coccidiosis in Makurdi. Therefore, this study was conducted to determine the prevalence of coccidiosis among broilers and layer chickens as well as to identify the risk factors associated with its occurrence in Makurdi.

II. Materials and Methods

Study area

This research was carried out in Makurdi, the capital of Benue State, Nigeria. Makurdi is located within the flood plain of lower River Benue between latitude 7^{0} 30'N and longitude 8^{0} 35'E. It is situated in the tropical guinea savanna zone of central Nigeria and experiences a typical climate with two distinct seasons. The dry season lasts from late October to March and the rainy season begins in April and ends in October (Tyubee, 2009).

Sample Collection

The simple random sampling method was used to collect faecal samples from broilers and layers reared under an intensive deep litter management system between July and October 2015. A total of 228 feacal samples (114 from each type of chicken) were collected from ten selected poultry farms in Makurdi. All samples were kept at +4 °C until analysis. Data such as flock size, age, coccidiostat administration and vaccination history were obtained from the poultry farmers through a questionnaire.

Sample Processing

The samples were processed in the Parasitology Laboratory of the Veterinary Teaching Hospital, Federal University of Agriculture Makurdi. Faecal floatation techniques was used following the guidelines outlined by Soulsby et al. (1982). The morphology and size of the sporulated oocysts were microscopically examined using a compound microscope at x10 and x40 magnification, as described by Conway and McKenzie (2007) for the presence of Eimeria oocyst.

Identification of Eimeria oocyst

Positive samples were identified with a diagnostic guide for identifying sporulated Eimeria oocysts by Conway and McKenzie (2007).

Data Analysis

Data were collected and analyzed initially in Microsoft Office Excel version 2011 to obtain percentages and prevalence of Eimeria oocysts. The prevalence (P) in percentage was calculated using the formula P = d/n, where d is the number of positive samples analyzed and n is the total number of chickens sampled. The statistically significant association between the risk factors and the infection was determined at $p<0.05$.

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III. Results and Discussion

The overall prevalence of Eimeria infection was 58.3% (133/228). The prevalence of Eimeria oocysts was higher in layers (62.3%) than in broilers (54.4%) chicken (Table 01). This prevalence rate is higher than 41.1% and 52.9% reported in previous studies in Nigeria from Vom, Plateau State and Makurdi Benue State (Muazu et al., 2008; Agishi et al., 2016). The higher prevalence rate recorded in this study could be attributed to the high relative humidity in Makurdi (Tyubee, 2009), as this has been reported to favour the sporulation of Eimeria oocysts (Etuk et al., 2004). The wet season during which the study was conducted, as well as poor management practices such as overstocking and poor sanitary conditions, may have contributed to the high prevalence of coccidiosis in this study (Etuk et al., 2004; Bachaya et al., 2012). Coccidia oocysts sporulate at 25–30°C with adequate aeration and water whereas dry conditions at 10°C hinder sporulation (Mohammed and Sunday, 2015).

The prevalence of 58.3% reported in the present study (Table 01) is however lower than (71.7%) reported by Dinka and Tolossa (2012) in Ethiopia, 80% by Al-Quraishy et al. (2009) in Saudi Arabia and 87.4% reported by Lawal et al. (2016) in Nigeria. The variation in previous investigations might be attributed to different factors such as sampling periods, geographic area and climatic conditions (Lawal et al., 2016). Haug et al. (2008) confirmed that the incidence of coccidiosis varied in different climatic zones.

The prevalence of Eimeria oocysts was higher in layers (62.3%) than in broiler (54.4%) chickens. The observed higher prevalence of coccidiosis in layer birds compared to broilers is in agreement with earlier reports from Kaduna State, Nigeria (Jatau et al., 2012; Hassan et al., 2020). Similarly, Dakpogan and Salifou (2013) reported high prevalence among laying birds in Benin. This finding could be attributed to the fact that layer birds are usually kept in deep litter systems for longer periods than broilers, thereby predisposing them to frequent contact with oocysts. Another risk factor could be stress of egg laying, oocysts multiplication tends to be higher when the birds are under stress in addition to warm moist weather and air. Furthermore, because layers are kept for more extended periods, they tend to develop some level of resistance to the coccidian parasite without showing overt clinical signs. The implication is that such adult layers continue to shed the oocysts in their faeces, contaminating the premises and constituting a source of infection to other birds on the farm (Kamani et al., 2021). Birds managed on deep litter show higher incidence of coccidiosis due to their close contact with the infective oocysts in the litter (Etuk et al., 2004).

Table 01. Prevalence of Eimeria oocyst in broilers and layers in Makurdi

Type of bird	No. of birds examined	No. of birds infected	Prevalence (%)
Broilers	114	62	54.4
Layers	114	71	62.3
Total	228	133	58.3

A significant association ($p < 0.05$) between the age of the birds and the incidence of the coccidiosis was observed. Higher occurrence of Eimeria oocysts was recorded in broilers aged 1-4 weeks (65.8%) and layers aged 25-30 weeks (83.3%) (Table 02 and Table 03). Coccidiosis affects chickens of all ages, but the infection begins at younger age when the immune system is immature. Coccidiosis is also most prevalent among young chicks of 1-5 weeks of age as oocysts could appear in faecal samples of birds as early as seven days of age, with the clinical disease manifesting by the fourth week (Majero et al., 2001; Obasi et al., 2001). In addition, since chicks are not immunized against coccidiosis, they can experience higher mortality rates in coccidiosis outbreaks, as observed by Chapman et al. (2005). Many investigations have reported that younger chicks are more susceptible to natural infections than older ones (Al-Quraishy et al., 2009; Amare et al., 2012).

Table 02. Prevalence of Eimeria oocysts according to age group of broilers in Makurdi

Age (in weeks)	No. of birds examined	No. of birds positive	Prevalence (%)
1-4	38	25	65.8
5-6	31	19	61.3
7-8	30	13	43.3
> 8	15	5	33.3
Total	114	62	54.4

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Table 03. Prevalence of Eimeria oocysts according to age group of layers in Makurdi

Age (in weeks)	No. of birds examined	No. of birds positive	Prevalence (%)
1-6	28	18	64.3
7-12	12	7	58.3
13-18	10	4	40.0
19-24	26	14	53.8
25-30	18	15	83.3
> 30	20	13	65.0
Total	114	71	62.3

Among birds that had no coccidiostat treatment, Eimeria oocysts were found to be higher (68%), whereas that of birds that received treatment was lower (55.6%) (Table 04). This outcome could be attributed to the development of immunity after prior prophylaxis. Anticcocidials have been applied more effectively through prophylaxis than through therapeutic means. Despite being relatively common in Nigeria, coccidiosis may be effectively treated by combining chemoprophylaxis with appropriate hygienic standards (Etuk et al., 2004; Adewole, 2012).

Table 04. Prevalence of Eimeria oocysts associated with coccidiostat administration

Treatment	No. of birds examined	No. of birds positive	Prevalence (%)
Coccidiostat administration	178	99	55.6
No coccidiostat administration	50	34	68.0
Total	228	133	58.3

IV. Conclusion

According to the findings of the current study, coccidiosis is common among broilers and layers in Makurdi, with a greater frequency among layers. The prophylactic administration of coccidiostat reduced the incidence of infection in the birds studied. In order to lessen the economic losses caused by the disease in the research region, the study recommends that strategic prevention, strong biosecurity policies and treatment against Eimeria should be developed and implemented.

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