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Prevalence and Associated Risk Factors of Coccidia Infection among Desi and Broiler Chickens in Gombe Metropolis, Gombe State, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Authors AJ and TIJ designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors EA, AR and YL managed the analyses and literature searches of the study. All authors read and approved the final manuscript.

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ABSTRACT

Aim: This study was carried out to determine the prevalence and associated risk factors of chicken coccidiosis within Gombe metropolis, Gombe State, Nigeria.
Study Design: Faecal samples were collected from a total of 100 desi and broiler chickens randomly and examined for the presence of *Eimerian oocyst*.
Place and Duration of Study: The study was carried out in Gombe metropolis, as from April-June, 2019.
Methodology: Floatation technique was employed to examine the presence of *Eimerian oocyst*. Parameters such as age, breed, management system and sites of sample collection were determined. Mean oocysts count was estimated using the modified McMaster counting technique.
Results: Out of the total 100 samples examined, 21 (21%) of the sample were positive for the Eimeria oocyst. Higher prevalence was recorded in desi birds with 21 (42%) positive. No positive case was observed 0(0%) in broiler birds. Chi square test shows that young chickens with 14 (28%) showed significantly higher prevalence than the Adult chickens with7 (14%). Chickens reared extensively were found to be affected 16 (64%) more than those kept under semi intensive

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system 16 (64%).The mean oocysts count per gram of faeces was higher (3246.40±817.70SD OPG) in young than adult (3035.70±587.16SD OPG) chickens. The management system revealed higher mean oocysts count per gram of droppings with 3390.60±714.66SD OPG in birds raised under extensive management system than the 2490.00±232.92SD OPG in birds kept under semi-intensive management system.

Conclusion: The presence of poultry coccidiosis in the study area shows that the disease is endemic and there is need to embark on proper sanitation, good bio security measures and the use of intensive system of management should be adopted by farmers to reduce the effect of the disease.

Keywords: Prevalence; coccidian infection; oocyst; floatation.

1. INTRODUCTION

In African countries including Nigeria, chickens are the most important species in terms of number and rate of investment in poultry production. Poultry's meat and eggs continue to be the major sources of protein for the rapid expanding population worldwide [1]. The global poultry production has increased dramatically in the last 20 years with more than 90 million tons of chicken meat and 1.1 trillion eggs now produced every year [2].

Poultry production contributes significantly to the socioeconomic development of many developing countries of the world [3]. In Nigeria, it is an important component of the livestock subsector which provides employment, income, and animal protein for urban and rural dwellers as well as manure for crop production [4]. Nigeria has the largest poultry population in Africa with an estimated population of about 130–150 million chickens [3]. Two system of poultry management is observed in Nigeria; the intensive and the extensive system. The broiler which are exotic chickens are managed intensively while the local also called the desi or backyard chickens are managed extensively where they are allowed to scavenge food for survival [5].

Coccidiosis is a disease that is caused by protozoan parasites mostly by this genus, developing within the intestine of most domestic and wild animals [6,1,7].Several studies established the prevalence and economic importance of coccidiosis as a major parasitic disease in both local and exotic breeds of poultry worldwide [8,9,10]. The prevalence of coccidian parasites has been shown to be common and significant in intensively managed commercial poultry farms, especially where management or hygienic standards are compromised [11].

Coccidiosis continues to be one of the most expensive and common parasitic disease in poultry in spite of advances made in prevention and control through chemotherapy, conventional vaccine, nutrition and genetic improvement and requires immediate intervention. In recent years, poultry rearing in Gombe has been gaining popularity. This has been attributed to their short incubation and maturity periods, low production cost and cheap source of protein. Coccidiosis occurs and is an endemic disease in domestic chickens in Gombe metropolis and has contributed to the losses in poultry rearing in Gombe due to its high mortality rate. This study is therefore geared towards determining the prevalence of coccidian infection in both desi and broiler chickens.

2. METHODOLOGY

2.1 Sample Collection

One hundred faecal samples were collected randomly from five different locations; Arawa, Pantami, Herwagana, Tumfure and Nassarawo. Twenty faecal samples were collected from each of the location. Faecal samples were collected from the early droppings of chickens using spatula and into a sampling bottle. Sampling bottles were properly labeled with the date of collection and number of sample. Different parameters such as system of management, age groups and area of collection were also recorded.

After collection, each sample was kept in ice pack box and was transported to the Parasitological Research Laboratory I, Department of Veterinary Parasitology and Entomology, University of Maiduguri, Borno State. Nigeria.

2.2 Processing and Microscopic Examination of Faecal Samples

Each sample was examined grossly for consistency, colour, and presence of blood and

faecal floatation technique was used to analyze the faecal sample for the presence of coccidian oocyst. Faecal sample from each bird was analyzed using saturated solutions.

2.3 Identification of Coccidian Oocyst

Identification of coccidian oocyst was carried out microscopically using their morphological characteristics as described by McDougald [12].

2.4 Pathogenicity Determination

The pathogenicity was determined by counting the number of oocysts per field when observed under the microscope as described by AlJumaili [13].

2.5 McMaster Counting of Oocysts

Mean oocysts count was estimated using the modified McMaster counting technique. Using a spatula, 2 grams of the positive faecal sample was weighed using a sensitive weighing balance (Scout made) and was grinded to fine particles using pestle and mortar. The resulting faecal sample was then dissolved in 48 ml of saturated salt solution and passed through a strainer into a container and allowed to stand for 5 – 7 minutes. Using a micro pipette, the two chambers of the McMaster slide were filled preceded by charging the McMaster slide for approximately 5 minutes. Oocyst counting was done under the microscope by counting the number of oocysts in the grid area of each chamber of the McMaster slide. The parasitic load was obtained using a method described by [14].

3. RESULTS AND DISCUSSION

3.1 Results

The result showed out of the total 100 samples examined, 21 (21%) of the sample were positive for the coccidian parasite. Higher prevalence was recorded in desi birds with 21 (42%) positive out of the 50 sample examined. No positive case was observed 0(0%) out of the 50 samples examined in broiler breed. However the intensity of infection shows that 14, 4 and 3 out of the 21 positive samples had very light infection, light infection and slightly heavy infection respectively (Table 1).

Chi square test showed the infection to be slightly more prevalent in young with 14 (28%) whereas the adult had 7 (14%) (Table 2). The result in Table 3 shows that the infection is significantly higher 16 (64%) in chickens reared extensively than chickens reared semi-intensively with 5 (20%). The least with 0(0%) was observed in chickens reared intensively. The result from Table 4 shows no statistical association between the infection and sample sites (*P=.05).* 4 (20%), 6(30%), 5(25%), 3(15%) and 3(15%) were positive of the coccidian oocyst out of the 20 samples each examined from Arawa, Pantami, Herwagana, Tumfure and Nassarawo respectively.

The mean oocysts count per gram of droppings showed in Table 5 is higher in young (3246.40±817.70SD OPG) than adult (3035.70±587.16SD OPG) chickens with no significant statistical difference (P=.05). The management system revealed higher mean oocysts count per gram of droppings with 3390.60±714.66SD OPG in birds raised under extensive management system than the 2490.00±232.92SD OPG in birds reared under semi-intensive management system. However there is significant statistical difference in the mean oocyst count across the two management systems. No statistical difference observed in mean oocyst count across the five sample sites. The highest mean of 3766.70±831.16SD OPG was recorded in Nassarawo and the least mean of 2866.70±502.66SD OPG was observed in Pantami.

3.2 Discussion

The overall prevalence of coccidiosis recorded in this study agrees with previous studies [15,16,17]. Coccidial infection in the current finding is higher in desi birds than that of broiler chickens. This finding is in line with the work of Ola-Fadunsin, [18] whose report stated that breed is a significant factor for the variation in prevalence of chicken coccidiosis with more prevalence in desi chicken. Variation of coccidiosis in desi and Cornish cross broiler may be due to desi chicken allowed to scavenge without restriction and thus more likely get contact with sporulated oocysts in faeces, which are the main source of infection, also the housing and management for broiler chickens in the study area was hygienic and most birds have been vaccinated. The result shows that the young chickens were more affected than the adults. The variation between Age groups may also be due to difference in management system, no maternal derived immunity or former immunity is not well developed in young chickens. Higher prevalence of the Eimeria infection was observed

Table 1. Prevalence of coccidiosis according to breed

Breed	No. examined	No. positive	Prevalence (%)	Chi Square	*P value*	Intensity		
						+	++	+++
Cornish cross)	50	0	0	26.582	0.00	0	0	0
(Desi)	50	21	42			14	4	3
Total	100	21	21					

Table 2. Prevalence of coccidiosis according to age group

Risk Factor	Categories	No. examined	No. positive	Prevalence (%)	Chi Square	*P value*	Intensity		
							+	++	+++
Age	Young	50	14	28	4.023	0.045	8	3	2
	Adult	50	7	14			5	2	1
Total		100	21	21					

Table 3. Prevalence of coccidiosis according to management system

Risk Factor	Categories	No. examined	No. positive	Prevalence (%)	Chi Square	*P value*	Intensity		
							+	++	+++
Husbandry	Intensive	50	0	0	9.934	0.002	0	0	0
	Semi-Intensive	25	5	20			4	1	0
	Extensive	25	16	64			11	2	3
Total		100	21	21					

Table 4. Prevalence of coccidiosis according to sample sites

Risk factor	Categories	No. examined	No. positive	Prevalence (%)	Chi Square	*P value*	Intensity		
							+	++	+++
Location	Arawa	20	4	20	2.049	0.812	2	2	0
	Pantami	20	6	30			6	0	0
	Herwagana	20	5	25			1	1	1
	Tumfure	20	3	15			2	0	1
	Nassarawo	20	3	15			1	1	1
Total		100	21	21					

Table 5. Overall comparison of poultry coccidiosis and mean oocysts count according to different risk factors

Risk Factors	Categories	No. examined	Mean±SD (OPG)	T value	*P value*
Age	Young	14	3246.40±817.70	0.605	0.552
	Adult	7	3035.70±587.16		
Husbandry	Semi-Intensive	5	2490.00±232.92	2.730	0.013
	Extensive	16	3390.60±714.66		
Location	Arawa	4	3030.50±644.69	0.850	0.514
	Pantami	6	2866.70±502.66		
	Herwagana	5	3370.00±962.16		
	Tumfure	3	3066.70±851.96		
	Nassarawo	3	3766.70±831.16		

SD = Standard Deviation OPG = Oocyst per Gram

in chickens reared under extensive management system than chickens reared under intensive and semi extensive management system. This result agrees with the report of [19]. This could be due to housing of intensive management birds throughout their life with the provision of good feed concentrates, good feeding and watering containers. Good attention is given on their vaccination schedule throughout their lives, good disease control prevention programs, etc. Chickens raised under semi-intensive management according to [6] were given some kind of attention which were lacking in chickens reared under extensive management. Therefore, the extensively managed chickens were at higher risk of the infection as they were allowed to go about scavenging food, an act that exposes them to ingesting coccidian oocysts residing in the soil. The mean oocyst count showed no significant difference (*P*=.05) in young and adult chickens but the count in semi-intensive and extensive management system showed a statistical significant difference. Whereas no statistical different was observed in the mean oocysts count across the sample sites. Such differences could be due to different *Eimeria* species infecting the chicken host. As described by [20], a high number of OPG could be related to the resistance of *Eimeria* species in chicken. [21] added that intensive breeding is an additional factor that favors propagation of the coccidiosis disease. The lower mean count in this study could be attributed to the scavenging local chickens are less likely to ingest a pathogenic level of the sporulated oocysts of the parasites as suggested by [1]. It has also been reported that there is need for an exposure equivalent to 100,000 OPG to produce 80% of mortality [22]. The pathogenicity of coccidia depends on the species involved, the number of oocysts ingested and the host's immune competence [23].

4. CONCLUSION

Coccidiosis is known to be prevalent and important disease of poultry production worldwide as high prevalence was recorded by many researchers. Despite the effort of farmers and veterinary health professionals to reduce the prevalence of coccidiosis,it is still a major burden to chicken producers. The result of the current study showed that different risk factors have contributed to the occurrence of the infection. Coccidiosis is still an important parasitic disease of chicken especially in desi birds, extensive management system and at younger age of birds in the study area.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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