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COCCIDIOSIS IN VILLAGE-SCAVENGING FOWLS IN ELIGBO, RIVERS STATE, NIGERIA

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ABSTRACT

Free range poultry is a veritable means of creating wealth and sustaining protein availability in the developing world. However, coccidiosis; a parasitic infection affects negatively the productivity of birds in the poultry. Two hundred faecal samples were randomly collected from village scavenging fowls from four villages in Eligbo community in Ahaoda East Local Government Area of Rivers State, Nigeria to determine their coccidiosis status. The sedimentation technique was used to analyse the faecal specimens. Data revealed an overall prevalence of 84(42.0%) with no disparity in the parasite load in both sexes. However, there was variability in the prevalence of Eimeria spp. in fowls from the various villages. This variability ($p<0.05$, $P=0.017385$) was associated with geographical specific factors with the Umuokuku village having the highest occurrence 32(16.0%), followed by Umuoho village; 22(11.0%), Umuordu village, 18(9.0%) and Umuokam village recording 12(6.0%). Age-related prevalence showed that the 1-6 weeks aged birds had the highest occurrence 42(50.0%), followed by the 7-16 weeks aged birds; 12(6.0%) while the 16+ weeks aged birds had 19(22.6%). Age related prevalence of Eimeria spp. in the study was statically significant ($p<0.05$, $P = 0.017385$). However, the decline in prevalence as age of fowls increased may be due to the build-up of immunity in the birds due to repeated infections under natural conditions. The relatively high prevalence recorded from the stool of the birds did not correspond with expected clinical symptoms at such parasite density. The suppressed morbidity in the birds inspite of relatively high coccidial density and diversity may be due to the foraging of the fowls on anti coccidial herbs in the environment.

Keywords: *Eimeria* spp., specific factor, morbidity, coccidial density and diversity,

INTRODUCTION

It has been a great challenge to scientists to determine the actual effects of parasitic diseases in terms of their health impact on the human population and their economic significance amidst the overt attention given to health and agriculture (Nzeako *et al*., 2015). According to Food and Agricultural Organization Report (FAO, 2000 and FAO, 2006), the global poultry industry accommodates about 14 billion birds comprising 75% in the developing countries. The demand for protein has progressively increased with increase in

world population especially as poultry keeping represents a mega contributor to the numerous world poverty alleviation strategies (Moreki, 2003, Abdu *et al.*, 2010) for resource poor nations. This is evident in the invaluable status of poultry products (flesh, eggs, bones and feathers) as sustainable sources of animal protein and a source of income to a lot of families (Abdu *et al.*, 2008). The economic viability and varied ecological suitability of domesticated fowls generally predispose them to specific parasitism such as coccidiosis. Coccidiosis: a geo-protozoan infection of birds and ruminants associated with the gastrointestinal tract of aves and mammals is particularly a menace to poultry worldwide (Ajala *et al*., 2007, Shirley, 1995, Permin, 1998, Magner, 1997, Majaro, 2001, Agi *et al*., 2010). The disease has been reported to contribute to about 8.5% losses in profit in large scale farms and 11.86% losses in profit in small scale farms annually (Abdu *et al.*, 2008). However, the actual contribution of coccidiosis to birds' morbidity and mortality in subsistent free range poultry that are rampant in Africa and Asia has not been ascertained globally. Mortality due to severe outbreak is usually devastating with recorded incidences of about 80.0% (Musa *et al,*. 2010, and Negesse, 1993). Heavy mortality and decreased productivity in chicken is often associated with poor management practices, suggesting that improved extension services especially in the rural areas could help in reducing incidence of the disease.

Distribution of Coccidiosis in Free Range Fowls

Keeping of freerange or scavenging fowls is a sustainable poverty alleviation strategy in almost all families in the rural and sub urban regions of Africa (Moreki 2003). This cultural practice eventually predisposes birds to coccidian infections occasioned by geophagy of birds (Agi *et al.*, 2010). The free range scavenging system of poultry is often bedevilled with myriads of challenges including; coccidiosis that strives on the ignorance of poultry keepers about healthy management practices (Braunius, 1980, Permin 1997a, Nsamba *et al*., 2006, Agi *et al.*, 2010). Generally, infected chicks indicate droopiness, paleness of the comb, diarrhoea, emaciation, ruffled feather, and dehydration. In mild attacks, loss of appetite and occasional appearance of blood in birds' droppings are evident in addition to the outlined symptoms. Destruction of the epithelial cells, dilation of the caecae, posterior lesion of the intestinal tract and death are common symptoms in severe attacks (Nsamba *et al*., 2006, Agi *et al.*, 2010).

Avian coccidiosis is usually occasioned by host specific species of protozoans in the genus; *Eimeria* that are cosmopolitan in distribution. In the host, the aetiology of coccidia indicates strict site specific parasitism even in poly infections. Studies have revealed the high prevalence of intestinal coccidiosis (constitutes majority of recorded cases) when juxtaposed with caeca coccidiosis. Majoro (1981) indicated that coccidiosis outbreak could be stalled in modern farms and effectively controlled under most circumstances since the risk factors associated with coccidiosis outbreak revolves around the maintenance of sanitary environments within and around poultry set-ups. Beside, the cultural control strategy, chemotherapy an effective control approach involves huge financial implication that is affordable to only wealthy farmers, thereby, making the disease one of the most expensive parasitic diseases encountered in

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the poultry industry in Nigeria (Permin, 1997b, Chapman and Jejjers, 2014, Blake *et al.*, 2015). With the increasing interest in poultry production as a sustainable alternative for food security and protein availability, it is pertinent to continually evaluate the prevalence and management cases associated with coccidiosis of poultry in Nigeria. This study is therefore designed to determine the parasite load of *Eimeria* Spp. in poultry in Eligbo Community in Ahoada East Local Government Area of Rivers State, Nigeria.

MATERIALS AND METHODS

The Study Area and Sample collection

The study area is Eligbo community in Ahoada East Local Government Area of Rivers State, Nigeria a sub-urban area. It lies between Latitude 5^{o} and 6^{o}N and Longitude 7^{o} and 8^{o}E. Climatic conditions are typical of the rainforest ecological zone. Samples were collected from the four designated villages; Umuokam, Umuohwo, Umuokuku and Umuordu that constitute Eligbo community. Informed consent of the owners of the fowls was obtained and the resting sites of the birds identified prior to stool collection. To avoid contamination of the stool samples, water proof beddings and raffia palm baskets were provided for each bird overnight. Droppings of the birds were scooped into sterile sample bottles with a sterilized spatula and fixed with 5% formaladehyde according to Agi *et al.*, (2010). Fifty (50) faecal samples of free range fowls were collected randomly from the four designated communities, making a total of 200 faecal collections. The sedimentation method according to Soulsby, (1968) and Chessbourough, (2005) was used in the preparation of the samples.

Data Analyses Measures of central tendency and Analysis of Variance were used to analyse the data.

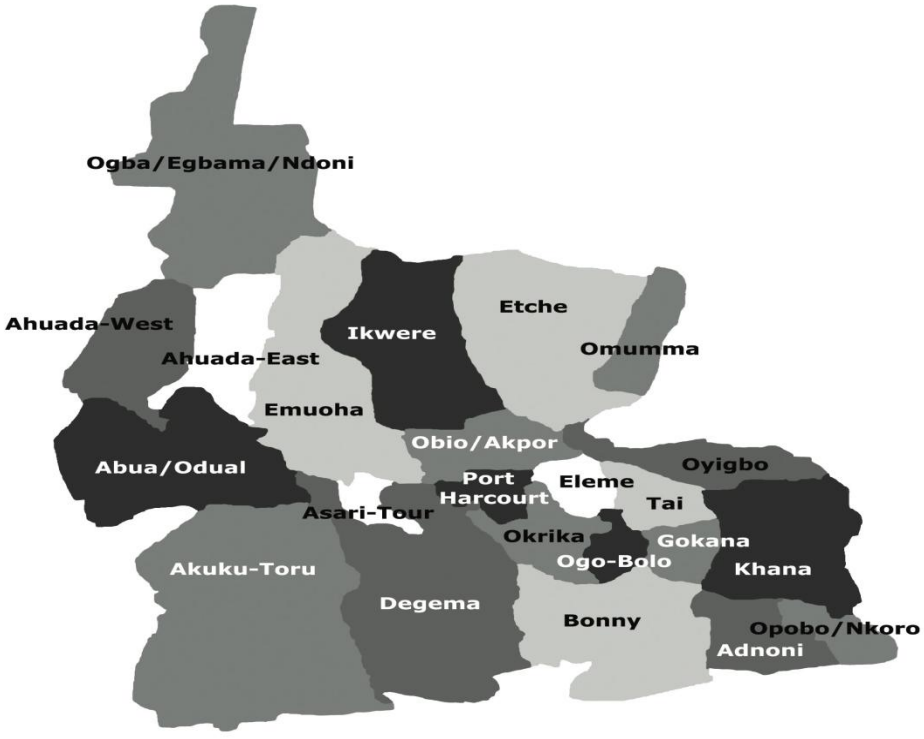

Figure 1. Map of Rivers State showing sampled Area for study

RESULTS

Parasite load in relation to sex of free-range fowls in Eligbo community

Feacal samples from a total of 200 birds were examined and 84(42.0%) were positive for *Eimeria* Spp. Geographical variability influenced *Eimeria* occurrence in the fowls as indicated by the variability in parasite load in relation to geographical location hence; birds from Umuokuku village recorded a parasite load of 32(64.0%); 12(24.0%) infection was observed in Umuokam, 22(44.0%) in Umuoho and 18(36.0%) in Umuordu villages. Out of the 97 male fowls examined, 42(40.7%) were infected while 52(53.6%) females fowls were infected out of the 103 examined. However, 14 (58.3%) males and 18 (64.3%) females were infected in Umuokuku, 7 (28.0%) males and 15 (60.0%) females in Umuokam, 11 (44.0%) males and 7(28.0%) females in Umuoho, and 10 (40.0%) males and 12(48.0%) females in Umuordu. There was no significant difference ($P>0.05$, $P = 0.811494$) in sex related parasite load within but there was a significant difference ($P <0.05$, $P=0.017385$) across the various sampling sites in the study Area (Table 1).

Table 1: Prevalence of coccidiosis in free-range fowls in Eligbo, Ahoada East

Communities in Eligbo	Overall Number of fowls Examined	Female fowls		Male fowls		Overall Prevalence (%)
		NE (%)	NI (%)	NE (%)	NI (%)	
Umuokuku	50	22(44.0)	14(63.3)	28(52.0)	18(64.2)	**32(16.0)**
Umuokam	50	25(50.0)	7(28.0)	25(50.0)	5 (20.0)	**12(6.0)**
Umuordu	50	25(50.0)	11(44.0)	25(50.0)	7 (28.0)	**18(9.0)**
Umuoho	50	25(50.0)	10(40.0)	25(50.0)	12 (48.0)	**22(11.0)**
Total (%)	**200**	**97(48.5)**	**42(43.3)**	**103(51.5)**	**42(40.7)**	**84(42.0)**

P= 0.017385 across the communities, P= 0.811494 within communities
NE=number of fowls examined on community level, NI=number of fowls infected on community level.

Age Related Prevalence in the Study

Age specific distribution of *Eimeria* Spp. in the study showed a 21.0% infection in the 1-6 weeks aged birds, 11.5% infection in the 7-16 weeks aged birds, and 9.5% infection in the 16+ weeks aged birds. Umuokuku village recorded a prevalence of 18 (81.0%), 8 (53.0%) and 6 (46.2%) for the 1-6 week, 7-16 weeks, and 16+ week aged birds respectively. In Umuokam; 6 (30.0%), 4 (36.4%) and 2 (10.5%) were recorded for 1-6 weeks, 7-16 weeks and16+ weeks aged birds respectively. In Umuoho, 10 (50.0%), 7(53.8%) and 5 (29.0%) for the 1-6 weeks, 7-16 weeks and 16+ weeks aged birds respectively. Data from Umuordu village showed a prevalence of 8 (34.7%) for 1-6 weeks, 6 (42.0%) for 7-16 weeks and 4 (30.8%) for 16+ weeks aged birds.

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Table 2: Age related prevalence of coccidiosis in free range fowls.

AGE	Umuokuku		Umuokam		Umuoho		Umuordu		Total (%)	
	NE	NI (%)	NE	NI (%)	NE	NI (%)	NE	NI (%)	NE	NI (%)
1-6	22	18(81.0)	20	6(30.0)	20	10(50.0)	23	8(34.7)	85	42(50.0)
7-16	15	8(53.0)	11	4(36.4)	13	7(53.8)	14	6(42.0)	53	23(27.4)
16+	13	6(46.2)	19	2(10.5)	17	5(29.0)	13	4(30.8)	62	19(22.6.0)
Total (%)	**50**	**32(16.0)**	**50**	**12(6.0)**	**50**	**22(11.0)**	**50**	**18(9.0)**	**200**	**84(42.0)**

P= 0.013464 across the communities, P = 0.0022870 within communities
NE=number of fowls examined on community level, NI=number of fowls infected on community level.

DISCUSSION

The study identified three *Eimeria* species; *E. acervulina*, *E. tenella*, and *E. maxima* affecting free range chickens in Eligbo, Ahoada East Local Government Area of Rivers State, Nigeria. The occurrence of these species varied greatly in terms of geographical spread and physiological specificity (sex related prevalence).The disparity in parasite load in the examined birds had a strong relationship with host specific factors as the examined birds were physiologically distinct (Majaro, 1981, 1980, Agi *et al*., 2010). This stems from the observation that birds that forage freely in the study area were of varied genetically but interbred regularly. The study also observed that the recorded diversity in the scavenging fowls in the study could be an advantage to farmers and the poultry industry because of the variable hosts' responses to coccidian morbidity in various fowl lines (Allen and Fetterer, 2002). The relatively moderate prevalence recorded in this study may be due to the repeated exposure of the birds to myriads of environmental conditions that may predispose them to parasitic diseases such as coccidian infection (Chapman and Jejjers, 2014). This finding complements the report by Macpherson (1978) who stated that minute variations in the global distribution of *Eimeria* species in domestic poultry existed. However, Fayer and Reid (1982) insisted that chickens usually reared on litter are susceptible to coccidian infection with accelerated parasite build up due to repeated infection.

Infective oocysts are usually prevalent in an environment where poultry occurs, and may be transported by the definitive host, paratenic avian hosts, rodent vermin, flying insects, other invertebrate pests, contaminated feed, old litter, human agents and basic poultry implements. This observation supports Adhikari *et al.*, (2008), who emphasised the significance of high sanitary status of the poultry as a criterion for sustaining the health of birds in any poultry activity.

The pattern of infection in the birds showed that older birds were more tolerant and resistant to the infection than younger ones. This trend was attributed to the build-up of immunity in the birds which is usually an accumulative process that improves as the age of fowls advance (Robinson *et al*., 2010). This pattern of immunity was replicated in the examined birds in all the

sampling sites (Agi *et al*., 2010, Blake *et al*., 2015). The study opines that the birds in the study were relatively immune to coccidiosis, considering the variability observed in age related parasite load in the various sampling sites (Table 2).

Sex related prevalence showed that both sexes in the study had relatively high parasite load. Although the number of birds examined for each sex differed, the number infected was similar with slightly different prevalence. The result indicated that the birds were exposed to similar environmental conditions and physiological differences did not influence the establishment of disease in the birds (Williams, 2001).

The free range fowls manifested some level of mixed infection but showed no specific observable clinical conditions, which was attributed to the build-up of immunity over time. Mixed infection in the study showed that *E. tenella* combination was more predominant within the communities when compared with other *Eimeria* species. Specific infections with *E. tenella* were less than 30% of recorded infections which is in conformity with the result of this study. However, Aryal (2001) stated that *E. tenella* was a more recurrent species in recorded mixed infection cases. Recurrent mixed infections erode the immune integrity of birds thereby escalating their susceptibility to opportunistic diseases; a fact, Bhanushi and Long (1985) and Gatechew *et al.,* (2008) agree with. In his suggestion, McDougald, (2003) stated that lack of stimulation of cross immunity between *Eimeria* species in the host makes it possible to have several and/or concurrent outbreaks of different *Eimeria* species in one flock. This could be why the prevalence of *E. tenella* and *E. maxima* were relatively more recurrent than other *Eimeria* species in the study.

This study has shown the presence of infectious *Eimeria* species scavenging fowls in the study area which showed great variability due to the genetic diversity of fowls in the study. This also affected the manifestation of clinical symptoms in the fowls. Free -range birds in Umuokuku showed higher tolerance to *Eimeria* infestations compared to the other villages. Although, the actual impact of coccidiosis has not be evaluated and free range fowls are relatively tolerant to the disease, manifesting virtually no symptoms. They remain one of the strategies that could be adopted in integrated pest management in poultry as they enable birds acquire immunity through repeated exposures to coccidian oocysts.

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