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ASSESSING THE PREVALENCE OF GASTROINTESTINAL TRACT PARASITES OF POULTRY AND THEIR ENVIRONMENTAL RISK FACTORS IN POULTRY IN IWO, OSUN STATE NIGERIA

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ABSTRACT

This study was carried out to identify and estimate the prevalence of intestinal parasites of poultry in Iwo local council of Osun state, Nigeria. A total of 250 layers comprising of 75 chicks, 100 growers and 75 adults were examined from five different poultry houses between April and July 2016 in different areas during the survey. Our finding showed that 62% were infected with different species of parasites. Parasites identified includes *Ascaridia galli*; coccidian; *Heterakis gallinae (*Caecal worm*)*; *Syngamus trachea (*Gapeworms); *Capillaria annulata* (Thread worm*)* and Tape worm. Among the helminthes, *Ascaridia, galli* was the most dominant species (17.2%). Generally, there was a significantly higher coccidia infestation relative to the helminthes ($P < .05$). Infection was greater among adults. There was no significance in prevalence of infection in relation to the location of poultry houses. There was high prevalence of mixed infections. Parasitism could be a big constraint to production in the study area and we recommend a sustainable control strategy.

Keywords: Prevalence; Risk factors; Gastrointestinal Parasites; Stocking density; Water source; Poultry

INTRODUCTION

Poultry is one of the most intensively reared of the domesticated species and one of the most developed and profitable animal production enterprises (FAO, 1987). Its importance in national economies of developing countries and its role in improving the nutritional status and income of many small farmers have been recognized by various scholars and rural development agencies in the last two decades (Eyinnaya, 1992). However, poultry production is hindered by many problems among which infectious diseases are most important (Permin & Hansen, 1998; Ruff, 1999; Ahmed and Sinha, 1993).

The presence of a few parasites does not usually cause a problem. However, large numbers can have a devastating effect on growth, egg production, and over-all health. Parasitism has been attributed to causes of reduced growth, egg production, emaciation, and anaemia as well as mortality (Belonwu, 1993; Hassouini and Belghyti, 2006; Heyradin *et al.*, 2012). These authors reported that mortality due to parasitic diseases was higher than those attributed to Newcastle disease and mortality causing viral infection of poultry. The concentration of parasite eggs in the poultry environment is one factor which plays a major role in determining the severity of the infection (Pinkney et al., 2008). The chicken pick up the parasite eggs directly by ingesting contaminated feed, water, or litter or by eating snails, earthworms, or other insects (intermediate hosts) which can carry the eggs. Clinical signs of parasitism are unthriftyness, poor growth and feed conversion, decreased egg production, and even death in severe infections. Furthermore, parasites can make the flock less resistant to diseases and exacerbate existing disease conditions. Yousuf *et al.* (2009) reported that parasitic infection or their concurrent infections result in immunosuppression, especially in response to vaccines against some poultry diseases. Of all the intestinal worms, large roundworms (*Ascaridia galli*) probably inflict the most damage with young birds being more severely affected. A mild infection is often not noticed but large numbers of worms, however, interfere with feed absorption causing poor growth and production. In severe infections, there can be actual intestinal blockage by the worms, causing death. Roundworms are passed from bird to bird by directly ingesting the parasite egg in faecal contaminated feed, water, or litter, or by eating grasshoppers or earthworms carrying the parasite.

Currently, there is a paucity of information regarding the prevalence of intestinal parasites of poultry in the study area. There is also the need to constantly assess the status of these parasites in poultry houses to check movement of these parasites. In addition, as cofactors in other poultry diseases, the knowledge of their prevalence is essential in understanding the risk factors of such diseases and the design of their appropriate control measures (Aniekwe, 1993). Therefore, the objective of the current study was to investigate the prevalence of gastrointestinal tract parasites of poultry and their risk factors in Iwo, Osun State, Nigeria.

MATERIALS AND METHODS

Method of Sampling and Population Size

The study area comprised areas in Iwo local Government council of Osun State namely: Oke-Ola, Oke-Odo, Oke-Ore, Oloba and Agoro with sub humid tropical climate. Five poultry houses using deep litter system were randomly selected one each from each area of the local council with an average of three poultry houses. Within each poultry house comprising of about 2000 birds, 50 birds were randomly selected for sampling with consideration for age. A total of 250 layers comprising of 75 chicks, 100 growers and 75 adults were involved in the survey. The sampling was done between the months of April and June 2016. Within the survey period, pre-survey visits were made to the selected poultry houses for an agreement on the sampling dates. During our interaction with the poultry house keepers, enquiries pertaining to mortality patterns among the various age groups, and the distribution of common observable symptoms were made. Information regarding the dynamics of flock size, number of eggs laid daily, source of feed and management practices were orally obtained from the poultry keepers.

Faecal Collection and Analyses

For each of the birds, faecal samples were collected per cloaca where possible or with a spatula for freshly voided faeces. The faecal samples were put into sample bottles and labelled appropriately. The samples were later processed in the laboratory using the salt floatation technique with saturated sodium chloride solution as the floating medium according to Richard (1995). Identification of helminth eggs and coccidia oocysts was done using a standard microscope under ×10 objective magnification. Egg and worm recovery, and identification were done in Biology laboratory of Osun State University, using the helminthological key by Soulsby, (1982)

RESULTS

Information from the poultry keepers revealed that total egg production in the different sampled poultry pens was between 50 - 60% prior to this investigation.

Table 1 shows the sampled population and the number of samples per poultry house. The result of the faecal analyses showed that of the 250 faecal samples collected, 180 (72.0%) of the samples were collectively positive for gastrointestinal parasites' eggs and coccidia oocysts (Table 2). Moreover, it was observed that Coccidian, *Ascaridia galli and Capillaria annulata are* the gastro-intestinal parasites highly prevalent in this study with prevalence of 43.0, 36.5 and 35.2% respectively, representing 180 members of the sample population. Among those positive for gastro-intestinal parasites, there were variations in the prevalence of the various gastrointestinal parasite types in the population, Tape worm *and Syngamus trachea* had the lowest prevalence rates among the adult birds as shown in Table 3. Multiple infections involving two or three parasite combinations were recorded of which *Ascaridia galli* and Coccidia combinations had the highest prevalence rate (Table 4). The frequency of occurrence of the parasites showed that no bird had single parasitic infection, 79.4% had mixed infection and harbored two parasites, 20.6% had three parasitic infections, while 28.0% of the birds were uninfected (Table 4). The prevalence of those with two and three parasitic

Table 1: Total number of poultry houses surveyed in Iwo, the names and their locations (N = 250)

S/N	Name of poultry house	Location	Code	No of Samples per poultry house	Size of pen	Average no of birds in a pen.
1	TUNWUM FARM	Ori-eru	A	50	$7m^2$	1000
2	NOBLE FARM	Oke-odo	B	50	$11m^2$	1500
3	JOY POULTRY	Oke-ore	C	50	$5m^2$	1000
4	MASHFAG POULTRY FARM	Agoro	D	50	$25m^2$	5000
5	NUDAD FARM	Oloba	E	50	$10m^2$	1000

Table 2: Age distribution of GIT infestation in the sampled population (N=250)

Age	No examined	No infected	Prevalence
Chick	75	75(100%)	54 (30%)
Grower	100	55(55%)	40 (22%)
Adult	75	50 (66.7%)	36 (20%)
	250	180	72%

Table 3: Overall prevalence rate of the various Gastro-Intestinal Tract (GIT) Parasite species in in Poultry reared birds in Iwo L.G.A (N = 250)

PARASITE SPECIES	CHICKS	GROWERS	ADULTS
Ascaridia galli	75	53	35
Coccidia	100	75	75
Heterakis gallinae (Caecal worm)	28	42	28
Syngamus trachea (Gapeworms)	0	18	15
Capillaria annulata (Thread worm)	76	42	24
Tape worm	0	2	28

Table 4: Prevalence of multiple infections of Gastro-Intestinal Tract (GIT) Parasite species in Poultry reared birds in Iwo Local Government Area (N = 250)

GIT parasite combinations	Chicks	Growers	Adults
AG + C	36	19	11
CA + AG	21	11	6
CA + AG + C	11	7	5
TW + AG	0	1	2
ST + AG	0	9	13
AG + TW + CA	0	1	2
HG + CA	7	7	11
Total	75	55	50

Key: AG = *Ascaridia galli*
C = *coccidia*
HG = *Heterakis gallinae (Cecal worm)*
ST = *Syngamus trachea*(Gapeworms)
CA = *Capillaria annulata (Thread worm)*
TW = Tape worm

Total number of birds infected with three different parasites = 143
Total number of birds infected with two different parasites = 37

Table 5: Prevalence of GIT parasites in relation to source of drinking water among the sampled poultry

S/N	Poultry code	Chicks (n = 75)			Growers (n = 100)			Adults (n = 75)			
		Well water	Bore-hole water	Stream/ river water	Well water	Bore-hole water	Stream/ river water	Well water	Bore-hole water	Stream/ river water	
1	A	--	--	15	--	--	15	--	--	13	43(17.2%)
2	B		--15	--	--	8		--	--9	--	32(12.8%)
3	C	15	--	--	15	--	--	13	--	--	43(17.2%)
4	D	15	--	--	--12	--	--	11	--	--	38(15.2%)
5	E	--	15	--	--	5	--	--	4	--	24(9.6%)
	TOTAL	30	30	15	27	13	15	24	13	13	180(72%)

Table 6: Prevalence of GIT parasites in relation to stocking density among the sampled poultry houses

S/N	Stocking density	Prevalence
1	143/m²	43(17.2%)
2	136/m²	32(12.8%)
3	200/m²	43(17.2%)
4	200/m²	38(15.2%)
5	100/m²	24(9.6%)

Furthermore, our study showed that prevalence of infections varied according to the age. Among the age group, the highest number of infection was recorded among the chicks (eight weeks) which had 75 (100%). This was followed by 55 (55.0%) recorded among the growers (sixteen weeks) and 50 (66.7%) in adults (thirty-two weeks). Tables 6and7 summarized the sources of water and stocking densities in relation to prevalence of GIT in the sampled poultry houses. Table 6 revealed that the poultry houses (Code A, C & D)) whose source of drinking water were the river/stream and well water had high prevalence rates for all the age groups, 43(17.2%), 43 (17.2%) and 38 (15.2%) respectively, while the least prevalence in relation to source of water was recorded in Code E with bore-hole as source of water 24 (9.6%). Prevalence in relation to stocking densities in the sampled poultry houses showed A, C and D with stocking densities 143/m^{2,} 200/m^2 and 200/m^2 having the highest prevalence rates of 43 (17.2%), 43 (17.2%) and 38 (15.2%) respectively.

DISCUSSION

The result of this study showed a wide range of parasitic infestations among the sampled birds in the study area. The prevalence of gastrointestinal helminths was considerably high out of which Coccidia and *Ascaridia galli* infection were the most common. This result is in agreement with earlier studies (Gary and Richard, 2012 and Calnek *et al*., 1997) in America and (Hassouini and Belghyti 2006, and Heyradin *et al*., 2012) in Morocco and Pakistan respectively. The prevalence of parasites' eggs of gastrointestinal tract in this study might be due to continuous ingestion of infected droppings or infected intermediate hosts of organisms such as beetles, cockroaches, earthworm flies and grasshoppers. The study revealed that cestodes parasites were recovered in the adult birds with low prevalence. This outcome might be an indication of the availability of infective stages of the worms in the study area and the ability of the infective stage of the worms to survive outside the host for a long time before it is picked by the host. Lack of tapeworm infection by the chicks in this study may be attributed to the netted cage provided for the chicks which prevented the intermediate host from having access to the chicks. Tapeworms require an intermediate host to complete their life cycle. These intermediate hosts include ants, beetles, houseflies, slugs, snails, earthworms, and termites.

Most works on the prevalence of gastrointestinal parasites in Nigeria were done on domestic chickens (Adang *et al.,* 2014*;* Ohaeri and Okwum, 2013; Adejinmi and Oke, 2011; Matur et al., 2010; Oniye *et al*., 2010; Ashenafi and Eshehu, 2004; Dawet *et al*., 2012; Yoriyo *et al*., 2008a & b; Ugwu, 1994; Fakae and Nwalusi, 2000; Fabiyi, 1972; Gadzama and Strivastava, 1986; Oyeka, 1989; Fatihu *et al*., 1991; Yoryo *et al*., 2008b; Luka and Ndams, 2007).

The few works on the prevalence of gastrointestinal parasites in poultry systems in Nigeria includes the following works (Ajayi and Ajayi, 1984; Belonwu, 1992; Eyinnaya, 1992: Lawal *et al.,* 2001). There was no known published work in this area of research in Iwo. The prevalence of the various helminth species in our study agrees with Fatihu *et al.,* 1991 who in a comparative study of parasitism in poultry houses in Zaria, Nigeria attributed infections to cause interference with host metabolism resulting in poor feed utilization and reduced growth rate as well as size and age at maturity. These were observed among the sampled birds in this study. The presence of the *Heterakis gallinae (*Caecal worm*): Syngamus trachea (*Gapeworms) and Tape worm in this study is also noteworthy because of its association with haemorrhagic enteritis which could complicate anaemia of ectoparasite origin (Russel & Springer, 2010). The presence of *Heterakis gallinae* also posed the danger of enhanced transmission of *Histomonas meleagridis* to susceptible poultry through the use of contaminated faecal material containing the eggs as manure in the environment. The differences in the prevalence rates of these parasites could be related to the differences in the prevailing environmental condition, since average minimum temperature could reflect poor survival of infective stages through cold weather conditions, while excystation can continue when temperatures increases (Smith, 1976).

The high prevalence of gastrointestinal parasites recorded in chicks in this study may be due to their exposure to a contaminated environment compared to their former well-controlled hatchery relative to growers and adults. The close prevalence recorded among growers and adults in this study may be immunity related because older birds tend to challenge parasites immunologically. The slight difference in prevalence of GIT among growers and adult recorded in this study could be density related. The fact that large number of growers was congested in a space and later spread out into larger space(s) during adult stage (Layers) as observed in this study reduced the stocking density of the adults. This was recorded in the present work where prevalence of infection increased with high stocking densities. This is in agreement with Permin & Hasen, (1998) who found out that differences in stocking rate led to different levels of establishment of *Ascaridia galli* infections in chickens; and that at high stocking rate there was a trend towards higher mean worm burden because of higher availability of infective eggs in the environment. Both studies based their results on number of birds per pen without consideration for the weight and the size of birds per the same sizes of pens. Further work is required in this area to reduce the chance of stocking density-related GIT parasitic infection.

The result on the prevalence of coccidia calls for urgent attention to their prevention and control. Prevalence of 100% may account for major productivity losses such as mortalities, reduced growth, and reduced size at maturity, poor egg lay and feed efficiency, which are the common clinical features of these parasites (Irungu *et al.,* 2004; Yoryo *et al.*, 2008a). The highest losses occurred during the chickhood period whch may be associated with coccidiosis. Earlier studies in Nigeria also demonstrated high prevalence of coccidiosis (Ajayi and Ajayi, 1984; Belonwu, 1992; Eyinnaya, 1992: Lawal *et al.,* 2001). Studies carried out in Kenya (Irungu *et al.,* 2004) showed that coccidiosis was a problem more related to intensive rather than extensive management. Moreover, the higher prevalence of coccidiosis among the chicks despite vaccination against coccidiosis (as discovered in this study) with apparent high chicks' mortality is indicative of low immunity and poor management practices. The concurrent infestations with two or more gastro-intestinal parasites in the study heighten their role in early chick mortality and other productivity losses among the adults. This is particularly true of conjoint infestations with helminths and coccidia whose combined effects on host metabolism could be devastating. The limitation of mixed infections to only a maximum of three helminths per bird indicated that both host species could be less susceptible to mixed infections or the presence of either or both parasitic species may preclude the establishment of others.

The relationship between the prevalence of infections and water source in this study is in agreement with Lawal, *et al.,* (2001) who attributed drinking water to the transmission of some bacterial, viral and protozoan poultry diseases.

In conclusion, this study demonstrated high prevalence of gastro-intestinal parasites among poultry within the survey period and ecological zone. Drinking water source, stocking density and the presence of free – range chicken in and around some of these poultry houses are factors that possibly pose a risk of contamination to the caged birds since free-range birds are considered as potential reservoirs for these parasites (Gary and Richard, 2012; Heyradin *et al.,* 2012). Based on the known pathologic effects of these parasites, the result of this study highlights both the eminent and potential constraints of these parasites to the overall poultry and egg production. Therefore, further studies are needed to determine the extent of these risk factors on egg production. This can be achieved by treating infected birds with antihelminthes drug and watch their performance in egg production. It is therefore recommended that the institution of a programmed control measure for improved harnessing of the potentials of poultry production in this region be put in place. Proper education of poultry farmers on the possible risk factors, appropriate stocking densities and the use of good or treated water will help to reduce the prevalence rate of these infections.

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