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Intestinal parasitic infection in commercial chickens in Sirajgonj

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ABSTRACT

Endoparasitism is among the important causes of reduced productivity of chickens. To investigate the prevalence of intestinal parasitic diseases, a study was carried out from March, 2017 to February, 2018 in dead broiler and sonali chickens from different commercial farms in Sirajgonj district by postmortem examination. A total of 500 intestinal samples (250 broilers and 250 sonali) were examined for the presence of worms and coccidian infection in the lumen of intestine. Among examined birds, 41 (16.4%) broiler and 56 (22.4%) sonali chickens were found to be infected with intestinal parasitic diseases including ascaridiasis (*Ascaridia galli*), raillietiniasis (*Raillietina* spp.) and coccidiosis (*Eimeria* spp.). Among these three, coccidiosis was the most predominant parasitic diseases (9.2% and 14.4%) followed by ascaridiasis (5.6% and 7.6%) and raillietiniasis (1.6% and 0.4%) in broiler and sonali chickens, respectively. The prevalence of intestinal parasitic diseases were significantly higher ($p<0.01$) in older broiler (>3 weeks- 31.8%) and sonali (5-9 weeks- 30.3%) birds than in young broiler (≤3 weeks- 4.3%) and sonali (1-4 weeks- 10.5%) birds. Female birds (23.1%) were 1.63 times more prone to intestinal parasitic diseases than male birds (15.5%) and it was statistically significant (p 0.05). In farm management system, significantly higher intestinal parasitic infection was recorded in deep litter system (23.5%) than in slatted system (11.6%). Significantly higher infection was observed during rainy season (26.5%), followed by summer (19.4%) and winter season (10.3%). It could be concluded that intestinal parasitic infections were prevalent in commercial poultry farms in the study area. Also, chickens irrespective of age, sex, management practices and seasons of the year were significantly associated with intestinal parasitic diseases that play an important role in decreased production in commercial poultry farms in Bangladesh.

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Introduction

Poultry production is increasing rapidly due to low establishment cost and efficiency of poultry to convert nutrients into animal protein (Frantovo, 2000). Commercial poultry farming has tremendously developed in recent years. Poultry population in Bangladesh is estimated about 326.44 million where chicken population is about 272.92 million (Chowdhury, 2011). Now a days, broiler and sonali (Fayoumi- Rhode Island Red Crossbred) industries are the largest and most successful and profitable agro-based industries in Bangladesh. Broiler and sonali chickens contribute 88.6% of all chicken meats consumed and thereby constitutes a strategic food and protein source (BER, 2017).

But poultry diseases play a major role for interfering with poultry productivity, which decreases economic returns and may therefore negatively affect the development of the industry (Abebe *et al.*, 1997). Parasitic diseases are most deciduous problem of chickens especially in the developing country and economic losses can be significant (Fatihu *et al.*, 1991). However, among parasitic diseases, intestinal parasitism are the most prevalent and most devastating pathogens affecting the poultry in terms of high morbidity and mortality, decrease production and cause low meat quality (Basit *et al.*, 2014; Luka and Ndams, 2007; Pam *et al.*, 2006; Permin and Hansen, 1998).

High incidence of helminth parasites in poultry is well documented from different parts of the world (Kulkarni *et al.*, 2001; Matta and Ahluwalia, 1981). The common intestinal parasitic diseases occur in poultry include nematodes, trematodes, cestodes and coccidian (Soulsby, 1982). The main genera of nematode include *Ascaridia, Heterakis* and *Capillaria* (Pattison *et al.*, 2007). Among these, Ascaridiasis has been convicted as the most common and most important parasitic disease of poultry (Luka and Ndams, 2007; Pam *et al.*, 2006). Poultry also infected with different cestodes such as *Raillietina, Davainea* and *Hymenolepis* (Luka and Ndams, 2007; Oniye *et al.*, 2000; Paul *et al.*, 2012). Railliteniasis is pathogenic and causes nodule formation in the intestine of birds. Among the protozoan diseases, coccidiosis is the most widespread in commercial as well as in backyard poultry and responsible for major economic losses in the poultry industry in Bangladesh (Karim and Trees, 1990) and abroad.

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The prevalence of most of the parasitic diseases in poultry seems to has reduced significantly in commercial poultry production systems due to improved housing, hygiene and management (Permin and Hansen, 1998). However, parasitic diseases continue to be of great importance in intensive systems of poultry rearing. The present knowledge on the prevalence and impact of parasitic diseases on productivity and health of broiler and sonali chickens is scarce in Bangladesh. Furthermore, Sirajgonj is one of the vital area for commercial broiler and sonali production in Bangladesh. Therefore, this study was conducted to identify the diseases caused by intestinal parasites in commercial broiler and sonali farms and to determine their prevalence in relation to age, sex, farming system and seasons of the year.

Materials and Methods

Study area

The present study was conducted in broiler and sonali chickens (Fayoumi-Rhode Island Red crossbred) at various farms of Sirajganj district in Bangladesh.

Study period

The study was carried out from March, 2017 to February, 2018 that covering three seasons; summer (March-June), rainy (July-October) and winter (November-February).

Selection of chickens

A total of 500 dead chickens (250 broilers and 250 sonali) were selected randomly from different commercial farms in Sirajgonj district for diagnosis of intestinal parasites diseases. The age, sex and rearing system of chickens were recorded carefully by interviewing with farm owners/ managers. According to age, broiler chickens were grouped into two age groups, ≤ 3 weeks and > 3 weeks; while sonali chickens were grouped into 1-4 weeks and 5-9 weeks aged birds. Chickens were divided into male and female group in accordance with sex. All birds were kept either under litter system or slatted system of housing.

Postmortem examination

Postmortem examination of the collected dead birds were performed as described by (Fowler, 1990). The whole intestinal tract was removed carefully and intestine was separated from other parts of the gastrointestinal (GI) tract. Then, small and large intestine were opened by longitudinal incision using a pair of scissors. The contents of small and large intestine were examined carefully to observe parasites. The intestines were washed thoroughly under running tap water. The mucosal surfaces were rubbed carefully between fingers to remove adhering parasites following the procedure of (Norton, 1964).

Collection and identification of parasites

Parasites were easily detected and collected using a pair of forceps. Parasites were washed with normal saline and identified under microscope using 10x objectives according to the keys and description of (Soulsby, 1982).

Statistical analysis

Data were subjected to analyze through descriptive statistics using Statistical Package for Social Sciences (SPSS) version 20.0 software program. Chi-square test was used to determine whether there existed any statistical significant differences in the prevalence of intestinal parasitic diseases in terms of age, sex, breed, rearing system and seasons of the year. A statistically significant association between variables was considered to exist if the calculated p-value is less than 0.05 with 95% confidence level. Odd ratio was obtained by the formula according to (Schlesselman, 1982).

Results

Prevalence of intestinal parasitic diseases

In the present study, a total of 500 chickens (250 broilers and 250 sonali) were examined. Of which 41 (16.4%) broiler chickens and 56 (22.4%) sonali chickens were found infected with intestinal parasitic diseases and overall prevalence was 19.4%. The detected parasitic diseases were ascaridiasis- 6.6% (*Ascaridia galli*- nematode), raillietiniasis- 1.0% (*Raillietina* spp.- cestode) and coccidiosis- 11.8% (*Eimeria* spp.- protozoa). The prevalence of ascaridiasis, raillietiniasis and coccidiosis in broilers were 5.6%, 1.6% and 9.2%, respectively. And, in case of sonali chickens, the prevalence was 7.6%, 0.4% and 14.4% for ascaridiasis, raillietiniasis and coccidiosis, respectively. Coccidiosis was found predominant both in broiler (9.2%) and sonali (14.4%). No mixed infection was observed in this study (Table 1).

Prevalence of intestinal parasitic diseases in relation to the age of host

In this study, it was observed that the prevalence of intestinal parasitic diseases in broiler chickens was significantly higher (p 0.0001) in > 3 wks aged chickens (31.8%) compared to ≤ 3 wks aged chickens (4.3%) (Table 2). In sonali chickens, significantly higher (p= 0.0005) prevalence of intestinal parasitic diseases was recorded in birds aged between 5- 9 wks (30.3%) and lower prevalence in birds aged between 1- 4 wks (10.5%) and the calculated odds ratio was 3.69. And infection by *Raillietina* spp. was not recorded in birds of 1-4 wks of age (Table 3).

Prevalence of intestinal parasitic infection in relation to sex

The present study revealed that intestinal parasitic diseases were more in female chickens (23.1%) than males (15.5%). The calculated odd ratio indicated that the female chickens were 1.63 times more susceptible to intestinal parasitic infection than the males and it was statistically significant (p=0.04). Both in male and female chickens, the highest prevalence were recorded for the coccidiosis (9.4% and 14.1%) followed by the ascaridiasis (5.3% and 7.8%) and lowest for the raillietiniasis (0.8% and 1.2%) (Table 4).

Table 1. Prevalence of intestinal parasitic diseases in commercial chickens

Name of parasites	Broiler (n= 250)		Sonali (n= 250)		Overall (n= 500)		Odds ratio	p-value
	Infected	Prevalence (%)	Infected	Prevalence (%)	Infected	Prevalence (%)		
Ascaridiasis	14	5.6	19	7.6	33	6.6		
Raillietiniasis	4	1.6	1	0.4	5	1.0	Sonali vs broiler	0.11^{NS}
Coccidiosis	23	9.2	36	14.4	59	11.8		
Overall	41	16.4	56	22.4	97	19.4	1.47	

n=Total no. of chickens examined.
NS= Non significant (p 0.05)

Table 2. Age-wise prevalence of intestinal parasitic diseases in broiler chickens

Category of age	Parasitic diseases	No. of birds affected	Prevalence (%)	Odds ratio	P value
≤ 3 wks (n=140)	Ascaridiasis	3	2.1	> 3 wks vs. ≤ 3 wks =10.4	0.0001**
	Raillietiniasis	1	0.71		
	Coccidiosis	2	1.4		
	Sub total	6	4.3		
> 3 wks (n=110)	Ascaridiasis	11	10.0		
	Raillitiniasis	3	2.7		
	Coccidiosis	21	19.1		
	Sub total	35	31.8		

n=Total no. of chickens examined.
**= Significant at 1% level (p<0.01).

Table 3. Age-wise prevalence of intestinal parasitic diseases in sonali chickens

Category of age	Parasitic diseases	No. of birds affected	Prevalence (%)	Odds ratio	P value
1-4 wks (n= 95)	Ascaridiasis	5	5.3	5-9 wks vs. 1-4 wks =3.69	0.0005**
	Raillietiniasis	0	0.0		
	Coccidiosis	5	5.3		
	Sub total	10	10.5		
5-9 wks (n=155)	Ascaridiasis	14	9.0		
	Raillietiniasis	1	0.7		
	Coccidiosis	31	20.0		
	Sub total	47	30.3		

n=Total no. of chickens examined.
**= Significant at 1% level (p<0.01)

Table 4. Prevalence of intestinal parasitic diseases in relation to sex of chickens

Sex of birds	Parasitic diseases	No. of birds affected	Prevalence (%)	Odds ratio	P value
Female (n=255)	Ascaridiasis	20	7.8	1.63	0.04*
	Raillietiniasis	3	1.2		
	Coccidiosis	36	14.1		
	Sub total	59	23.1		
Male (n=245)	Ascaridiasis	13	5.3		
	Raillietiniasis	2	0.8		
	Coccidiosis	23	9.4		
	Sub total	38	15.5		

n=Total chickens examined.
*= Significant at 5% level (p<0.05)

Prevalence of intestinal parasitic infection based on housing systems

Prevalence of intestinal parasitic diseases in chickens of commercial farms were found to be significantly higher (p=0.002) in litter system (23.5%) compared to slatted system (11.6%). Chickens reared in litter system were 2.33 times more prone to intestinal parasitic diseases than that of reared in slatted system. Individual prevalence of diseases of chicken reared in litter and slatted system were presented in Table 5.

Prevalence of intestinal parasitic diseases in relation to the season of the year

In this study, season had a significant effect on the prevalence of intestinal parasitic diseases in chicken. The highest prevalence was recorded in rainy season (26.5%), followed by summer (19.4%) and winter season (10.3%). Prevalence according to the diseases in different seasons was represented in Table 6.

Table 5. Prevalence of intestinal parasitic diseases in relation to rearing system of chickens

Type of rearing system	Parasitic diseases	No. of birds affected	Prevalence (%)	Odds ratio	P value
Litter system (n=328)	Ascaridiasis	19	5.8	2.33	0.002 **
	Raillietiniasis	4	1.2		
	Coccidiosis	54	16.5		
	Sub total	77	23.5		
Slatted system (n=172)	Ascaridiasis	14	8.1		
	Raillietiniasis	1	0.6		
	Coccidiosis	5	2.9		
	Sub total	20	11.6		

n=Total no. of chickens examined.
**= Significant at 1% level (p<0.01).

Table 6. Prevalence of intestinal parasitic diseases in relation to seasons of the year

Seasons	Parasitic diseases	No. of birds affected	Prevalence (%)	Odds ratio
Summer season (n=170)	Ascaridiasis	14	8.2	Summer vs. winter 2.08
	Raillietiniasis	2	1.2	
	Coccidiosis	17	10.0	
	Sub total	33	19.4[a]	
Rainy season (n=185)	Ascaridiasis	13	6.9	Rainy vs. winter 3.12
	Raillietiniasis	2	1.1	
	Coccidiosis	34	18.4	
	Sub total	49	26.5[b]	
Winter season (n=145)	Ascaridiasis	6	4.1	
	Raillietiniasis	1	0.69	
	Coccidiosis	8	5.5	
	Sub total	15	10.3[c]	

n= Total no. of chickens examined.
Values with different letters within a column in each variable differ significantly (p 0.05)

Discussion

Intestinal parasitism is one of the major problems in chickens. Severe infections decrease production performance (Gauly *et al.*, 2005; Permin and Hansen, 1998), utilization of nutrients, and behavioral alterations (Daş *et al.*, 2012) of birds. The environment plays a vital role for the occurrence of infective stages of parasites. Beside this, management practices, level of bio-security, availability of intermediate hosts, and possibly game reservoirs are the key factors for the high prevalence of parasitic diseases (Catelli *et al.*, 1999; Permin *et al.*, 1999) in poultry. The chickens get infection directly by ingesting contaminated feed, water, or litter or by eating snails, earthworms, or other insects (intermediate hosts) that can carry infective stage (Soulsby, 1982). The geo-climatic conditions (e.g., rainfall, humidity and ambient temperature) in Bangladesh are suitable for growth and development of parasitic populations.

The present study indicated that the overall prevalence of intestinal parasitic diseases were 19.4% where 16.4% in broiler chickens and 22.4% in sonali chickens. But (Abebe *et al.*, 1997) found higher prevalence (97.89%) of intestinal parasites in free range chickens in Ethiopia compared to the present study. This high prevalence in Ethiopia might be due to free range chickens which get continuous exposure from the environment during taking food. On the other hand, our study was performed in farms and birds have minimum chance of getting parasitic infection.

Ascaridiasis, raillietiniasis and coccidiosis were recorded in the present study. In previous studies, most of the authors found more or less similar infections such as ascaridiasis, heterakisiasis, capillariasis, raillietiiasis, and coccidiosis in Northern Thailand, Nepal, India, Nigeria and Ghana (Javaregowda *et al.*, 2016; Ola-Fadunsin *et al.*, 2019; Subedi *et al.*, 2018; Wuthijaree *et al.*, 2018).

In this study, prevalence of intestinal parasitic diseases was significantly varied between different age groups of chickens and it was observed that infection rate increased with the increased age of chickens in both broiler and sonali. This result confirms the reports of other authors (Beyene *et al.*, 2014; Ola-Fadunsin *et al.*, 2019; Paul *et al.*, 2012) where they found higher parasitic infection in chickens of advanced age. Higher prevalence of parasitic diseases in older chickens might be due to increased chance of contact with the intermediate hosts in advanced age. Lower prevalence in young chickens may be due to lower exposure to external environment. In the contrary, (Hembram *et al.*, 2015) showed that the prevalence of parasitic diseases was higher in young (77.7%) chickens compared to aged chicken (51.3%). However, this difference may be due to differences in the collection of sample, study methods and climatic conditions of the experimental area.

This study revealed that the sexual dimorphism of host played an important role in the susceptibility of the chickens to parasitic diseases. We found significant association of sex (female-23.1%, male-15.5%) with intestinal parasitic diseases. The present finding is in agreement with the previous findings (Beyene *et al.*, 2014; Hafiz *et al.*, 2015; Hembram *et al.*, 2015; Matur *et al.*, 2010; Satish and Priti, 2013) where they found higher prevalence in female birds. But, (Yoriyo *et al.*, 2008) observed that there was no natural affinity of GI parasitic diseases to either sex of the host.

It was noted that types of rearing system had a significant ($p<0.05$) effect on the prevalence of parasitic diseases in chickens. Litter system housing is most common when raising broiler chickens used for white meat production (Appleby *et al.*, 1992; North, 1984). In this system, better litter management is crucial for providing good litter quality and for controlling the ammonia level inside the poultry houses. Although, slatted floor housing has been available for many years. Due to poor leg health and poor meat quality of broilers, it is not widely used in broiler (Shields and Greger, 2013) but frequently used in rearing of sonali chickens especially in Bangladesh. In slatted system, droppings cannot come in contact with the chickens and therefore there is less chance of entering the infection (egg, oocyst of parasites) into host body, resulting in lower prevalence of parasitic infection.

The season had a remarkable effect on the prevalence of parasitic diseases in chickens. Incidence and worm burden decrease with decreasing temperature and rainfall (Fotedar and Khateeb, 1986). In this study, highest prevalence was recorded in rainy season and lowest in winter season. The results of the present study are in agreement with the previous findings (Hembram *et al.*, 2015; Salam *et al.*, 2010). According to (Taylor *et al.*, 2016), optimum temperature and relative humidity for development and hatching of eggs or oocyst are 26-29 °C and > 80%, respectively. The development is decreased below 10 °C and low relative humidity.

Conclusion

Parasitism is one of the major problems that affects the health and productivity of chickens. Three intestinal parasitic diseases such as ascaridiasis, raillietiniasis and coccidiosis were detected in this study and coccidiosis was the most prevalent in broiler and sonali chickens. Age, sex, management system and seasons of the year had significant effect on the prevalence of intestinal parasitic diseases in broiler and sonali chickens. These parasitic diseases remain as a major hurdle against the profitable poultry production in poultry producing belts of Bangladesh and necessary preventive and control measures should be implemented strictly by poultry producers of these areas.

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