Gastrointestinal parasitic infection in diverse species of domestic birds of Manipur, India

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Abstract Domesticated birds (515) consisting of 185 broiler (*Gallus gallus domesticus*), 130 layers (*Gallus* Sp), 75 free range local chicken (*Gallus domesticus*), 40 house pigeon (*Columba livia*), 70 ducks (*Anas platyrhynchos*) and 15 turkeys (*Melleagris gallopavo*) reared in valley districts of Manipur were investigated for intestinal protozoan and helminthic infections. Fresh faecal samples of these birds were examined microscopically by direct wet smear with 2.5 % potassium dichromate ($K_2Cr_2O_7$). Of these 412 (80 %) were found to be infected with different species of gastrointestinal parasites. The highest (90.8 %) prevalence of these parasitic infections was found in broiler followed by layer (78.5 %), duck (75.7 %), house pigeon (75 %), Turkey (66.7 %) and free range local chicken (65.3 %), etc. A total of 10 species of intestinal parasites were encountered. Among these, the protozoans *Eimeria* and *Isospora* were the most common (68.3 %) followed by mixed infection of protozoan and Helminths.

Keywords Birds · Helminths · Protozoa · Prevalence

Introduction

Domestic birds have significant contributory role in national economy and social economic condition all over the world. In India, especially in rural areas farmers and agriculturists still depend economically on these animals. But the production of domestic birds is hampered by the presence of parasites like Protozoans and Helminths. Besides mortality and morbidity in domestic birds, protozoan and helminth parasites also cause considerable economic loss in terms of productivity, growth and increased susceptibility of animals to other parasitic infections, susceptibility to other infections and death in young birds (Radfar et al. 2012). These protozoan and helminth parasites are well known as gastrointestinal parasites. Gastrointestinal parasite directly or indirectly affects the economy of poultry rearing in number of ways such as lowered fertility, reduced work capacity, reduction in food intake, lower weight gain and egg production, treatment cost and mortality in heavily parasitized animals. Intestinal parasites problems is also due to the bad managements like wet litter, bad ventilation, high density of birds, improper consumption and contaminated feeders (Ruff, 1993). It is essential to have knowledge about the farm conditions for developing the best prevention program, enabling the recognition of factors that influence the possibility of incidence of the disease (Graat et al. 1998). Prevalence studies have been undertaken in many tropical countries such as Nigeria (Nnadi and George 2010), Kenya (Mungube et al. 2007), Ethiopia (Eshetu et al. 2001), Zambia (Phiri et al. 2007), Morocco (Hassouni and Belghyti 2006), India (Yadav and Tandon 1991) and Iran (Eslami et al. 2009). The present study was undertaken to find out various gastrointestinal parasites and helminth parasites and their prevalence in diverse species of domestic birds of Manipur.

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Materials and methods

A cross-sectional coprological survey (April 2012–March 2013) was carried out in rural areas and villages of four districts of Manipur, India for the prevalence of gastrointestinal protozoan and helminthic infections in domestic birds like local breed chicken, broiler, layer, turkey, etc. Faecal samples of 515 domesticated birds consisting of 185 broilers (*Gallus gallus domesticus*), 130 layers (*Gallus domesticus*), 75 local chickens (*Gallus domesticus*), 70 ducks (*Anas platyrhynchos*), 40 house pigeons (*Columbia livia*) and 15 turkeys (*Meleagris gallopavo*) were collected aseptically in sterile plastic containers having 10 % formalin with unique identification numbers from households and live bird markets. Study sites, species, age and sex were recorded. Age was accessed according to farmer's interview and close examination of domestic birds based on characteristics described by Grimmett et al. (2011).

Direct smear followed by floatation and simple sedimentation techniques described by Urquhart et al. (1996) was used to identify the eggs of parasites in the faeces. The modified McMaster counting technique as described by Soulsby (1986) and Tibor (1999) was performed to determine the parasitic load (egg per gram/oocysts per gram). Salt sugar solution at specific gravity of 1.27, was used as floatation fluid for performing the floatation technique as well as for the McMaster technique (Pereckiene et al. 2007). Floatation technique is usually performed to identify eggs of Cestodes and Nematodes. The detection limit (analytical sensitivity) for these types of tests without additional concentration methods such as centrifugation is around 10 eggs per gram of faeces (Leveck et al. 2012). Eggs of *Eimeria* spp., *Isospora* spp., *Ascaridia* spp. and *Heterakis* spp. were differentiated by observing the morphology and micrometry of their eggs. Size of oocyst of *Eimeria* spp. is 24.08–37.84 $\mu\text{m} \times 17.20$ –27.52 μm

Table 1 Intestinal protozoan and helminthic infection in domestic birds rearing within valley districts of Manipur, India

Sl. no.	Birds (species)	Faecal sample examined	Samples positives			Total
			Protozoan	Helminths	Mixed	
1.	Broiler	185	151 (81.6)	9 (4.9)	8 (4.3)	168 (90.8)
2.	Layer	130	80 (61.53)	15 (11.5)	7 (5.4)	102 (78.5)
3.	Free range local chicken	75	43 (57.3)	5 (6.7)	2 (2.7)	50 (66.7)
5.	Duck	70	42 (60.0)	9 (12.9)	2 (2.9)	53 (75.7)
4.	House pigeon	40	28 (70.0)	2 (5.0)	–	30 (75.0)
6.	Turkey	15	8 (53.3)	–	2 (13.3)	10 (66.7)
Total		515	352 (68.3)	38 (7.4)	22 (4.3)	412 (80.0)

Figures in parentheses indicate percentage

Fig. 1 a *Eimeria* sp., b *Isospora* sp., c *Ascaridia* sp., d *Capillaria* sp., e *Echinostoma* sp., f *Rallientina* sp., g *Choanotaenia* sp., h *Heterakis* sp., i *Strongyloides* sp., j *Trichuris* sp.

Table 2 Distribution of gastrointestinal parasites in diverse species of domestic birds

Parasites	Domestic birds						Total
	Broiler	Layer	Free range local chicken	Duck	House pigeon	Turkey	
Protozoan							
<i>Eimeria</i> spp.	151	80	43	42	–	8	324
<i>Isospora</i> spp.	–	–	–	–	28	–	28
						Total	352 (68.3)
Helminths							
i) Nematodes							
<i>Ascaridia galli</i>	2	4	2	1	1	–	10
<i>Heterakis</i> sp.	2	3	1	1	–	–	7
<i>Capillaria</i> sp.	2	3	1	2	–	–	8
<i>Trichuris</i> sp.	1	1		1	–	–	3
<i>Strongyloides</i> sp.	1	2	1	1	–	–	5
						Total	33 (6.4)
ii) Cestodes							
<i>Raillientina</i> sp.	1	1		1	1	–	4
<i>Choanotaenia</i> sp.	–	1		1		–	2
						Total	6 (1.2)
iii) Trematodes							
<i>Echinostoma</i> sp.	–	–		1		–	1
						Total	1 (0.2)
Mixed	8	7	2	2	–	2	22 (3.9)
Total	168 (93.3)	102 (78.5)	50 (49)	53 (75.7)	30 (75)	10 (66.7)	412 (80)

(Adhikari et al. 2008) and size of an egg of *Ascaridia* spp. is 75–80 $\mu\text{m} \times 40\text{--}50 \mu\text{m}$, whereas *Heterakis* spp. is 63–75 $\mu\text{m} \times 36\text{--}48 \mu\text{m}$ (Urquhart et al. 1996).

Results and discussion

412 (80 %) faecal samples collected from different species of domestic birds such as broiler, layers, ducks, free range local chicken, pigeon and turkeys were found to be positive for Proto-Helminth infections (Table 1) in different location of Manipur (Fig. 1b). 22(4.3 %) samples revealed evidence of mixed infection of protozoan and helminth. In the present study, species of protozoan and helminthic parasites identified were presented as Fig. 1a–j. Among these parasites, two were protozoans i.e. *Eimeria* and *Isoospora* and the remaining were Helminth and Nematodes (Tables 1 and 2).

The highest (90.8 %) prevalence of parasitic infection was observed in broiler followed by layer (78.5 %), duck (75.7 %), house pigeon (75 %), free range local chicken (66.7 %), and turkey (66.7 %). The birds were found to have 68.3 % infection with protozoa, 6.4 % infection with nematodes, 1.2 % infection with Cestodes, 0.2 % infection with trematodes and 4.3 % mixed infection. Ducks were

found to be infected with trematodes only. The protozoans found in the domestic birds were of two species, *Eimeria* sp. and *Isoospora* sp. and the Nematodes found consist of *Ascaridia* sp., *Heterakis* sp., *Capillaria* sp., *Trichuris* sp. and *Strongyloides* sp. Two species of Cestodes i.e. *Raillientina* sp. and *Choanotaenia* sp. and one species of trematodes i.e. *Echinostoma* sp. were also recorded. The most common protozoa detected was *Eimeria* sp. (62.9 %) followed by *Isoospora* sp. (5.4 %) and Nematodes & Helminths detected was *Ascaridia* sp. (1.9 %) followed by *Capillaria* sp. (1.5 %), *Heterakis* sp. (1.4 %), *Strongyloides* sp. (0.9 %), *Raillientina* sp. (0.7 %), *Choanotaenia* sp. (0.3 %) and *Echinostoma* sp. (0.2 %). Mixed infections were also detected (Table 2).

The overall prevalence of gastrointestinal parasites varied according to species of birds. In domestic ducks and geese it was 10–50 % in Tanzania (Muhairwa et al. 2007), 75 % in pigeons in Brazil (Marques et al. 2007), 34 % in captive wild birds in India (Patel et al. 2002), 25–55 % in indigenous domestic ducks, 20 % in resident wild birds, 40 % in migratory birds. The common parasites were *Ascaridia* sp., *Heterakis* sp., *Capillaria* sp. and *Eimeria* sp. (Cordon et al. 2009 and Adejinmi and Oke 2011). In addition to these, *Strongyloides* sp., *Raillientina* sp., *Trichuris* sp., *Echinostoma* sp. and *Isoospora* sp. were also

found in the present study. Prevalence of gastrointestinal parasites had seasonal variability as documented in different bird species by Yousuf et al. (2009). Parasitic infections hampered growth and egg production and infected birds were more susceptible to other infections (Dranzoa et al. 1999).

The Nematode and Helminth infection were very low in this present study as compared to reports from other areas. In others areas of India it was reported as 90.9 % (Yadav and Tandon 1991), in Ethiopia it was 91 % (Eshetu et al. 2001), in Iran it was 96–100 % (Farahnak et al. 2004; Eslami et al. 2009), in Morocco it was 89.9 % (Hassouni and Belghyti 2006), in Kenya it was 93.3 % (Mungube et al. 2007), in Zambia it was 95.2 % (Phiri et al. 2007), in Nigeria it was 87.7 % (Yoriyo et al. 2008), in Trinidad it was 10.5 % (Baboolal et al. 2012) and in Tanzania it was 52 % (Muhairwa et al. 2007). The lower prevalence of intestinal Nematodes and Helminths in Manipur (7.4 %) might be due to the differences in the species of birds studied, the quality of husbandry and geographical location. Another possible reason that might have made the differences in prevalence was the possibility of less exposure to suitable intermediate hosts. Among the nematodes and helminths, the Nematodes were 6.4 %, Cestodes were 1.2 %, trematodes were 0.2 and 4.3 % were mixed infection including protozoans. The highest prevalence of protozoa was found in Broiler (90.8 %), followed by Layer (78.5 %) and the least was in Turkey and Free range local chicken (66.7 %). *Eimeria* sp. was detected from all the species of domestic birds studied except House Pigeon whereas *Isospora* sp. was found.

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