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SHORT COMMUNICATION

Prevalence of Gastrointestinal Parasites of Captive Birds in Punjab, Pakistan

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A B S T R A C T

A survey was conducted to investigate the point prevalence of gastrointestinal (GI) parasites of captive birds. Fecal samples from 613 captive birds belonging to 19 species were examined from Gujranwala and Jhang districts by using direct and indirect methods under the microscope. Protozoa, nematodes, cestodes and trematodes contributed 69.33, 35.39, 6.61 and 0%, respectively, to the overall prevalence of 54.32%. The predominant parasite species were in the genera *Eimeria* (67.87%), followed by *Ascaridia* (33.93%), *Capillaria* (11.41%) and *Hymenolepsis* (6.61%). Age and rearing systems of birds were considered as risk factors for GI parasites. Adult captive birds were more commonly infected (58.05%) than yearlings (37.27%). The captive birds reared in aviaries had a higher prevalence of infection (83.51%) than cage-birds (49.23%). In light of these findings, age and rearing systems were identified as highly significant risk factors ($P<0.05$) for Gl parasitic infection in the captive birds.

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INTRODUCTION

Birds have a supreme place being exceptionally valued by humans. Out of 18,000 species of birds all over the world, in Pakistan, 786 different species of birds have been reported (https://en.wikipedia.org/wiki/List_of_birds _of_Pakistan). By definition, "captivity" includes the keeping of domestically raised as well as wild-caught birds in cages and enclosures. They are reared for gaming and fancy (decorative) purposes and are also important from an emotional and economic perspective. In recent years, due to a dramatic increase in the human population and subsequently the shortage of accommodations, people are encouraged to adopt captive birds as pets in replacement of dogs and cats. However, birds in captivity in Pakistan and elsewhere face many potential disease problems, including parasitic infections. Parasites of the gastrointestinal (GI) tract including protozoa, nematodes, cestodes and trematodes have been incriminated in robbing hosts off nutrients, minerals and vitamins and causing serious conditions like enteritis, immuno-suppression, poor performance, stunted growth, poor reproductive efficiency and sometimes death (El-Shahawy and Abou Elenien, 2015). Based on a review of the published literature, there have been few studies undertaken in Pakistan focusing on the GI parasites of birds, especially with reference to parasites of captive birds. In this backdrop, this study was carried out to ascertain the point prevalence of GI parasites, with the main focus on captive birds in Gujranwala and Jhang districts (Punjab-Pakistan).

MATERIALS AND METHODS

Captive birds: This study included (n=613) captive birds belonging to 19 various species of birds. Individual species were as follows; *Anas platyrhynchos*; *Columba livia domestica*, *Zenaida macroura*), *Pavo cristatus*,

Coturnix japonica, *Phasianus colchicus*, *Serinus canaria*, *Lonchura oryzivora*, *Carpodacus puniceus*; *Nymphicus hollandicus, Melopsittacus undulatus*, *Psittacus erithacus, Psittacula krameri*, *Agapornis personata*, *Agapornis fischeri*, *Agapornis roseicollis*, *Psittacula eupatria*, *Aratinga solstitialis*. Gujranwala and Jhang districts were selected as study area due to their favorable geo-climatic conditions for parasites and dense population of captive birds. Apparently healthy captive birds that were not exposed to any anti-parasitic were selected for convenient sampling from March-November 2017 for this study. Birds were either housed in cages (70%) or aviaries (30%) depending on their size and nature, either individually or in groups.

Parasitological procedures: Fresh faecal droppings were collected in sterile, pre-labeled plastic vials in the early morning from pet shops, pet houses, and aviaries. Simultaneously, the collected samples were also subjected to macroscopic examination for their odor, color, consistency, and presence of blood and mucus and tapeworm proglottids. All the samples (n=613) were processed through direct wet mount preparation and centrifugal floatation techniques (El-Shahawy and Abou Elenien, 2015) in the laboratory. Diagnosis of *Cryptosporidium* spp. was made by faecal examination microscopically using acid-fast staining (Chalmers and Katzer, 2013).

RESULTS AND DISCUSSION

In total, 54.32% (333/613) of the captive birds were found positive for GI parasites. Prevalence of protozoa, nematodes, cestodes and trematodes was 69.33, 35.39, 6.61 and 0%, respectively. Among the observed parasites, the predominant parasites were *Eimeria* spp. [67.87% (226/333)] followed by *Ascaridia* spp. [33.93% (113/333)], *Capillaria* spp. [11.41% (38/333)] and *Hymenolepsis* spp. [6.61% (22/333)]. Among protozoa, *Cryptosporidium* spp. [9.90% (33/333)], *Entamoeba* spp. [8.10% (27/333)] and *Balantidium* spp. [6.60% (22/333)] were observed (Table 1). During the necropsy of a peacock, adult *Ascaridia* (*A.*) *galli* were recovered. Captive birds of all age groups showed parasitic infection but adults (≥1 year old) had a higher prevalence (58.05%) than young birds (37.27%). Higher prevalence was recorded in those birds housed in aviaries (83.51%) as compared to cages (49.23%). Significant association of gastrointestinal parasites with age and rearing system were found in the captive birds (Table 2).

Table 1: Prevalence of different gastrointestinal parasites of captive birds in district Gujranwala and Jhang, Punjab-Pakistan

Birds	Scientific name	Percent positive (No. positive/ No. tested)	Nematodes	Cestodes	Trematodes	Protozoa
Anseriformes						
Mallard Duck	*Anas platyrhynchos*	50.00 (2/4)	-	-	-	*Balantidium* spp.
Columbiformes						
Domestic Pigeon	*Columba livia domestica*	100 (16/16)	-	-	-	*Eimeria* spp.
Mourning Dove	*Zenaida macroura*	0 (0/12)	-	-	-	-
Galliformes						
Peafowl	*Pavo cristatus*	75.00 (12/16)	*Ascaridia galli*	-	-	*Balantidium* spp. *Eimeria* spp.
Japanese Quail	*Coturnix japonica*	0 (0/20)	-	-	-	-
Ring-necked Pheasant	*Phasianus colchicus*	0 (0/4)	-	-	-	-
Passeriformes						
Domestic Canary	*Serinus canaria domestica*	0 (0/35)	-	-	-	-
White java Sparrow	*Padda spp.*	50.00 (24/48)	*Ascaridia galli* *Capillaria* spp.	-	-	*Eimeria* spp. *Cryptosporidium* spp.
Red-fronted rose Finch	*Carpodacus puniceus*	50.00 (14/28)	*Ascaridia galli*	-	-	*Eimeria* spp. *Entamoeba* spp.
Psittaciformes						
Cockatiel	*Nymphicus hollandicus*	80.00 (56/70)	*Ascaridia galli* *Capillaria* spp.	-	-	*Eimeria* spp.
Budgerigar	*Melopsittacus undulates*	63.83 (150/235)	*Ascaridia* spp. *Capillaria* spp.	-	-	*Eimeria* spp. *Balantidium* spp.
Grey Parrot	*Psittacus erithacus*	60.00 (12/20)	*Ascaridia galli*	-	-	*Eimeria* spp.
Rose-ringed Parakeet	*Psittacula krameri*	60.00 (9/15)	*Ascaridia galli*	-	-	*Entamoeba spp.* *Cryptosporidium* spp.
Blue Masked Lovebird	Agapornis personata	50.00 (15/30)	*Ascaridia galli*	*Hymenolepis* spp.	-	-
Fischer's Lovebird	*Agapornis fischeri*	39.10 (9/23)	-	*Hymenolepis* spp.		*Eimeria* spp.
Lutino Peach-faced Lovebird	*Agapornis roseicollis*	47.05 (8/17)	*Capillaria* spp.	-	-	*Eimeria* spp. *Cryptosporidium* spp.
Lory	Species in the tribe Loriini	0 (0/4)	-	-	-	-
Alexandrine Parakeet	*Psittacula eupatria*	0 (0/4)	-	-	-	-
Sun Conure	*Aratinga solstitialis*	50.00 (6/12)	-	*Hymenolepis* spp.	-	*Eimeria* spp.
TOTAL		54.32% (333/613)				

Table: 2: Mantel–Haenszel chi-square and multivariate logistic regression analysis of all hypothesized risk factors

Risk factors	Variables	Prevalence % (No. positive/No. tested)	Mantel–Haenszel chi-square (P value)	Odds ratio (Multivariate logistic regression) logistic regression)
Age	Adult	58.05 (292/503)	19.1672 (0.0005)	0.821
	Young birds (<1 year)	37.27 (41/110)		
Rearing system	Cages	49.23 (257/522)	27.5273 (<0.0001)	1.739
	Aviaries	83.51 (76/91)		

Captive birds are capable of transmitting diseases not just regionally but internationally due to their intermingling with migratory birds. A total of 54.32% of the captive birds of the study area were positive for GI parasite infection. In the previous study, captive birds in Pakistan were reported (67.70%) with GI parasites (Khan *et al*., 2010). The salient difference in the current findings versus the previous reports is the high percentage of protozoa (69.33%) as compared to nematodes (35.39%) and cestodes (6.61%). Direct life cycle, low infective dose with short incubation period and the ability to survive in harsh environments might be the factors contributing to the high prevalence of these protozoan GI parasites (Thompson and Smith, 2011). Most of the birds were harboring multiple species of *Eimeria*. In another study, Parsani *et al*. (2003) reported 85.48% *Eimeria* spp. in captive birds. Other protozoa observed in this study were *Cryptosporidium* spp., *Entamoeba* spp. and *Balantidium* spp. In various countries, the prevalence of C*ryptosporidium* spp. ranges from 1.4-7.2% (Ziegler *et al*., 2007) whereas the prevalence of *Entamoeba spp.* and *Balantidium spp.* have been reported as 17% (Cunha *et al*., 2008) and 2% (Otegbade and Morenikeji, 2014), respectively. Among helminthes, *A. galli.* was the second most recorded GI parasite in this study. *Capillaria* spp. was the other nematode recorded in this study. Nevertheless, in this study clinical signs of *A. galli* and *Capillaria* spp. were not found in any bird. In a previous study, 20.75 and 13.2% prevalence of *A. galli* and *Capillaria* spp. were observed in captive birds, respectively (Patel *et al*., 2000). Among the most common cestodes reported in captive birds, only *Hymenolepsis* spp., a harmless to mild- pathogen was found in this study.

The high frequency of GI parasitism in captive birds might be due to ingestion of contaminated droppings or intermediate hosts such as cockroaches, beetles, earthworm, flies and grasshopper in poorly managed aviaries. A higher prevalence in adults found in this study, might be attributed to the cohort effect and stress of captivity, however, the parasitic prevalence in young birds <1 year old was also high, which suggests that infection occurs in early life when they have less immunity to tackle the infection (Radfar *et al*., 2012).

Conclusions: GI parasitic infection is common in the captive birds in Punjab-Pakistan. Examination of the faecal samples of the captive birds on a routine basis (fortnightly, since the life cycle of these protozoa is one to two weeks) with effective treatment programs to control and prevent GI parasites is recommended.

Authors contribution: HJ and MZA conceived the idea. MAZ designed the study. AYK along with HJ and MA collected the droppings and documented the necessary information. SY, MZF, TUR, AS, MFQ, TH and DDB analyzed the data and subsequent draft of the final form of the manuscript.

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