



Research Article

Epidemiological Survey of Fecal Parasites in Domesticated Doves in District Jhang, Pakistan

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Abstract | Doves are the birds found worldwide in towns and villages as well as on the banks of rivers. These birds are also kept as pets by the fanciers in the city in small cages. The aim of current study was to determine the parasitic burden in doves through the routine laboratory procedures. The prevalence of *Eimeria* and *Capillaria* spp. were recorded as 75% and 25% respectively in district Jhang. Whereas, mixed infection (*Eimeria* spp. + *Capillaria* spp.) was not detected in the examined birds. Eggs per gram (EPG) counted through McMaster technique for the *Eimeria* was 700, while that for *Capillaria* was 850. Proper control measures, good management and public guidance are needed to control these infections. This is the preliminary study performed for determining the incidence of endoparasites in doves in the district Jhang. However, the incidence of these parasites in doves requires confirmation through molecular assays.

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Keywords | *Capillaria* spp., Dove, *Eimeria* spp., Fecal examination



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Introduction

Doves and pigeons representing the *Columbidae* family are found all over the world (Yabsley *et al.*, 2015). These birds are used for the meat production and recreational purposes. Different parasites live in the gastrointestinal tract of the wild birds affecting the normal health status of the host, however most of the infections are subclinical but in some cases mortalities occur in the immuno-compromised birds (Lyles and Dobson, 1993; Atkinson *et al.*, 2009). Parasites become pathogenic in the captive birds

with high stocking densities. Effective management, health care and nutrition are necessary for the welfare of zoo species (Mellor *et al.*, 2015). Fecal examination is the most frequently used method to determine the prevalence of endoparasites (Sood *et al.*, 2018; Sobotyk *et al.*, 2021).

Coccidia oocysts are usually found in the feces of captive and wild birds as Pathogenic *Eimeria* species causing the enteric diseases in the birds leading to huge economic losses, while diarrhea is caused by coccidiosis in many species of birds (Brice and Thomas,

2018). Columbiformes are occasionally described to have a high degree of diverse parasitism together with coccidia (Ortúzar-Ferreira *et al.*, 2019). *Coccidia* is typically identified on the specific morphology along with quantification of oocysts and genotyping of particular genetic factors (Duszynski and Wilber, 1997; Tenter *et al.*, 2002; Berto *et al.*, 2011). Hence, the current study was conducted to find the incidence of fecal parasites in domesticated doves of Jhang district using the routine diagnostic methods.

Materials and Methods

Collection and examination of fecal samples

Fresh 400 fecal samples were collected from the local home-based fanciers and local markets of district Jhang in the plastic bags. All the samples were transported and processed through direct smear examination, sedimentation and flotation techniques for the detection of parasites in the Parasitology Laboratory at CVAS, Jhang. Briefly, 0.5 gram of fecal sample was mixed with 5 ml of distilled water, homogenized well and filtered through a sieve. Two drops were taken from the filtrate and placed on a glass slide and covered with a coverslip that was examined under the microscope (Nikon, Model Eclipse E200LED; Nikon Corporation, Tokyo Japan) for the detection of oocysts (Madlala *et al.*, 2021). The positive samples were further determined through sedimentation and flotation methods.

The sedimentation method was performed as described by (Latif *et al.*, 2016). In this procedure, 3 grams of the fecal sample was mixed with distilled water and sieved. Following that centrifugation was performed at 1500 rpm for two minutes. Subsequently, the supernatant was thrown away and a droplet of sediment material was placed on fresh and clean glass slide to detect the oocytes under microscope at 4X, 10X and 40X. The flotation technique was performed as described by (Faust *et al.*, 1938). McMaster counting method was used for the counting of eggs per gram (EPG) in faecal sample as described by (Foreyt, 2013).

Statistical analysis

Statistical analyses were carried out by means of Quantitative Parasitology (QPweb) software Version 1.0.10 (Ham-Dueñas *et al.*, 2017). Different parasitological parameters such as percentage prevalence, mean intensity and mean abundance were calculated following the standard statistical procedures characterized by (Rózsa *et al.*, 2000).

Results and Discussion

Overall, 320 samples were found positive for one protozoan (*Eimeria* spp.) and one Helminth (*Capillaria* spp.) out of total sample examined. The doves were more frequently parasitized with the *Eimeria* spp. as compared to *Capillaria* species. The prevalence of *Eimeria* and *Capillaria* spp. were recorded as 75% and 25%, respectively in district Jhang. While, mixed infection (*Eimeria* spp. + *Capillaria* spp.) was not detected in any bird (Table 1). EPG counts for *Coccidia* and *Capillaria* were 700 and 850, respectively.

$$*No. \text{ of birds (infected) / total no. of birds examined (infected and non-infected)} \times 100$$

$$**Total \text{ no. of parasites within infected host / total no. of infected birds with that parasite}$$

$$***Total \text{ no. of individual parasites in infected host / total no. of hosts examined (infected and non-infected)}$$

The poultry birds that are kept in controlled sheds receive proper management, care, feeding, and vaccination against various harmful infections (Corkery *et al.*, 2013). Due to proper hygienic measurements, they are less prone to parasitic disease (Kaboudi *et al.*, 2016). However, doves are reared in the open houses and have unhygienic environment, mismanagement and neglected feeding without proper vaccination. Therefore, these birds are more prone to parasitic infection.

The prevalence of *Eimeria* and *Capillaria* spp. were recorded as 75% and 25%, respectively in district Jhang. There are different gastrointestinal parasites

Table 1: Measures of fecal parasites (prevalence, mean intensity and mean abundance) identified in dove fecal samples.

Parasite species (Dove)	Total infected birds (n)	Infected bird (n)	Not infected bird (n)	Prevalence infected birds (%)	Mean intensity	Mean abundance
<i>Eimeria</i> spp.	320	240	80	75	1.33	0.6
<i>Capillaria</i> spp.		80		25	4	0.2

that have been reported by various frequencies varying from 15 to 80 % around the globe (Faust and Pappas, 1977; Fallacara *et al.*, 2004; Holsback *et al.*, 2013; Hoque *et al.*, 2014; Parsani *et al.*, 2014). Eggs, larvae and oocysts have the main role for the transmission of various parasites from free range birds to zoo birds in the captivity through feces or ingestion of infected intermediate host (Schmidt and Roberts, 1989; Atkinson *et al.*, 2009). Several scientific reports showed abundance of gastrointestinal parasites in wild birds (Fanelli *et al.*, 2021), while the transmission of endo-parasites amongst avifauna in zoological localities in nearby zones is poorly studied yet. Carrera-Játiva *et al.* (2018) identified the several parasites of captive birds whereas the current study found the similar parasites of free-ranging birds that includes *capillaria* and *Eimeria* as the most abundant species (Carrera-Játiva *et al.*, 2018). Coccidiosis was also reported in other poultry birds which usually limits the production and marketing of different meat-type birds especially pheasants, quails and chukar partridges (Mbong Ngwese *et al.*, 2020; Madlala *et al.*, 2021). In a prior study, Partridges showed no noticeable infection however, grey quails exhibited mild infection (Teixeira *et al.*, 2015). In another study performed on two adult pigeons at Ludhiana, India, with the history of weakness, anorexia, ruffled feathers and intermittent diarrhea showed the coccidian oocysts alongside eggs of *Capillaria* spp. (Sood *et al.*, 2018). *Eimeria* spp. was identified through fecal samples of doves (*Zenaidamacrourea*) from Kentucky, USA (Yabsley *et al.*, 2015) that resembles our current findings. *Coccidia* species have also been identified in columbiformes since long ago. Moreover, *Eimeria* spp. and *Isospora* spp. have been reported in *columbiformes* and identified on the basis of oocyst morphology (Ortúzar-Ferreira *et al.*, 2019).

Eimeria was detected in 7% of 254 mourning doves that were inspected by direct fecal smear examination along with thickened duodenal mucosal lesions in some doves in several states of USA (Barrows and Hayes, 1977). Furthermore, 33% of 45 doves in several areas of northern Florida while 49% of 53 doves in the different zones of southern Florida were found infected with nonspecific type of *Eimeria* species (Conti and Forrester, 1981). It seems that the greater prevalence noticed in doves from Florida was probably linked to the usage of fecal flotation technique as compared to the direct smear method. In the present study, egg per gram (EPG) was recorded as moderate

level of infection (700 for *Eimeria* spp. and 850 for *Capillaria* spp.) because of moderate temperature and moderate humidity in November, that are not very favorable conditions for parasitic infections. Similar findings were also reported by (Qamar *et al.*, 2017).

Another scientific study described temperature and humidity with relation to level of infection as found in the current investigation (Parsani *et al.*, 2014). They reported that nematode infection was found at moderate level when the temperature was low, high level of infection was attributed to monsoon weather (June to September) and the decreased rates were recorded during summer season (February to May). Moreover, the prevalence and level of parasitic infection is influenced by the epidemiological factors such as sex, age and breed (Djelmoudi *et al.*, 2014).

Conclusions and Recommendations

Therefore, it is concluded that the doves were infected with different types of gastrointestinal parasites. This was the preliminary report on the prevalence of endoparasites in doves. Nevertheless, the prevalence of these infections in doves would be better confirmed by molecular techniques. Necessary prevention and control programs should be implemented to reduce the risk of doves to get parasitic infections. Furthermore, proper management tools and public awareness strategies should be applied to stop the spread of pathogens from doves to other livestock.

Author's Contribution

MFQ: Supervised the entire work and wrote manuscript.

ARA and TH: Helped in planning of the experiment.

IL and ARA: Helped in the analysis and refining the manuscript.

IL: Helped in statistical analysis of data.

TH: Helped in collection of data.

Conflict of interest

The authors have declared no conflict of interest.

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