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Occurrence of coccidiosis in chicken from Puducherry

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Abstract

A total of 200 chicken intestines, which included (n=150) broilers and (n= 50) desi birds were collected from different locations of Puducherry. The faecal samples were examined both qualitatively and quantitatively for oocyst of Eimeria spp. Out of 200 intestinal samples, 60 samples were found positive for Eimeria spp. by qualitative examination. Following quantitative examination by McMaster Technique, the highest OPG (oocyst per gram) detected was 1,95,900 and the lowest OPG was 3800. The occurrence of Eimeria in chicken from Puducherry was 30 per cent. The overall Eimeria infection in broilers and desi birds was 30.66 per cent and 28 per cent, respectively. Examination of hemorrhagic and nodular lesions in GI tracts of both broilers and desi birds revealed the presence of oocysts of Eimeria either in caecal or intestinal forms. Histopathology studies revealed the presence of developing and developmental stages of Eimeria in the lamina propria, characterised by desquamation of enterocytes, as well as in the epithelial cells and submucosal cells, with massive infiltration of heterophils and mononuclear cells. Besides haemorrhages, degeneration and desquamation of cells, mild to moderate with lymphoid hyperplasia was observed.

Keywords: *Occurrence, coccidiosis, qualitative examination, OPG, histopathology, Eimeriidae*

Coccidiosis, caused by species of the genus *Eimeria* (family Eimeriidae, phylum Apicomplexa), is a major poultry disease that affects chickens of nearly all age groups and infects the intestinal epithelial cells intracellularly (Kim *et al.,* 2019; Kumar *et al.,* 2023). The disease poses a significant health risk to birds in intensive poultry operations, in zoo settings, and sin wild populations, especially when their habitats become overcrowded (Duszynski *et al*., 1970). The disease can affect any type of poultry in any production system and results in substantial economic losses (Elmusharaf and Beyene, 2007; Blake *et al.,* 2020).

Eimeria spp. is omnipresent and can survive in infected birds and the environment for long times (McDougald, 2003). They are highly specific and damage the intestinal mucosa and sometimes cause death (Ruzica *et al*., 2005; Kaboudi *et al.,* 2016) with more prevalence in chicken of 6-8 weeks of age (Julie, 1999) and high mortality in birds of 3-18 weeks of age (Nematollahi *et al.,* 2009; Toulah, 2007; Lawal *et al.,* 2016). About seven species of *Eimeria* including *E.*

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tenella, E. necatrix, E. brunetti, E. acervulina, E. maxima, E. mitis, and *E. praecox* are the causative agents of coccidiosis in chickens (Hamidinejat *et al.*, 2010; Lawal *et al.,* 2016; Kers *et al.,* 2018). Cocccidiosis has been reported in chicken at Tarai region of Uttarakhand (56.25%) by Pant *et al.,* (2018). Occurrence of poultry coccidiosis in different management systems in and around Thrissur, Kerala was reported to be 37.66 per cent by Pooja *et al.* (2021). In desi chicken, the occurrence of 12.27 per cent of coccidiosis has been reported by Chitradevi (2022) from Coimbatore, Tamil Nadu. Ahad *et al.* (2015) had reported an occurrence of 29.87 per cent of coccidiosis in broiler chicken from Kashmir valley and Sharma *et al.,* (2013) has reported an occurrence of 39.58 per cent of coccidiosis in an organised poultry farm from Jammu region. Vadivoo *et al.* (2020) has observed reported 7.66 per cent of coccidiosis in desi chicken in Tiruppur, Tamil Nadu. Das *et al.* (2020) had reported 30.12 per cent coccidiosis in backyard poultry in the subtropical hilly region of Meghalaya. There are no reports on the occurrence of coccidiosis in chicken in Puducherry. Hence the present study was designed to find out the occurrence of *Eimeria* infection in broiler and desi chicken from Puducherry.

Materials and methods

Study area and collection of samples

A total of 200 intact whole chicken intestines of both backyard (n=50) and broiler (n=150) were procured from local chicken outlets located in Puducherry. The intestines of both backyard and caged broiler chicken were processed at the Department of Veterinary Parasitology, Rajiv Gandhi Institute of Veterinary Education and Research, Puducherry, as per standard protocol.

Qualitative faecal examination by the floatation method

Approximately 3 g of faeces was taken into a mortar and pestle and mixed with 50 ml of flotation fluid (saturated salt solution, Specific Gravity 1.2). The mixture was sieved through a tea strainer, and the resulting suspension was poured into flotation tubes until a convex meniscus formed at the rim of each tube. A glass cover slip was placed over the rim of the test tube for 10 min, placed on a microscopic slide and was examined under low (10X) and high power (40X) objectives of a light microscope.

Quantitative examination

Eimeria positive faecal samples (20 numbers) were subjected to quantitative examination by both McMaster and Stoll's techniques.

Histopathological examination

Highly infected intestinal samples (mainly duodenum and caecum with nodules in caecal mucosa and haemorrhages in intestines) selected after screening the samples collected from chicken outlets located in Puducherry were considered for histopathological examination. Tissue samples were fixed in 10 per cent neutral buffered formalin (NBF) and processed by routine paraffin embedding techniques. Tissue sections of 4-5µm thickness were prepared and stained by routine Haematoxylin and Eosin staining (H&E) for detailed histopathological studies (Luna, 1968).

Results and discussion

Out of 200 chicken intestines examined, overall infection of *Eimeria* was observed in 60 (30%) intestines based on qualitative examination for the presence of oocysts irrespective of whether they were broiler or desi birds (Table 1). Among these 60, 43 (71.7%) intestines had lesions of caecal coccidiosis, and 17 (28.3%) intestines had lesions of intestinal coccidiosis (Table 1).

In case of the caecal coccidiosis, lesions were confined to the caecum in almost all the birds, resulting in thickening of the caecal mucosa and moderate to heavy haemorrhage (Fig. 1).

Fig. 1. Blood mixed contents in *Eimeria*-infected caecum of broiler chicken

Table 1. Occurrence of *Eimeria* infection in chicken in and around Puducherry

Birds	Caecal coccidiosis (%)	Intestinal coccidiosis (%)	Total (%)
Broiler (n=150)	35 (76.1)	11 (23.9)	46 (30.66)
Desi bird (n=50)	8 (57.1)	6 (42.9)	14 (28)
Total (n=200)	43 (71.7)	17 (28.3)	60

n= Number of birds

Fig. 2. Petechial haemorrhage in the duodenum of *Eimeria* infected broiler chicken

Fig. 3. *Eimeria* infected caecum of desi chicken, depicting nodular lesion

In case of intestinal coccidiosis, the lesions (petechial haemorrhage) were observed mostly in duodenum (Fig.2) and predominant nodular lesions due to *Eimeria* spp. were observed in the posterior half of the small intestine, as well as in the caecum (Fig.3), in addition to petechial haemorrhage. Examination of scrapings of the lesion confirmed the existence of *Eimeria* spp.

The infection of *Eimeria* observed in broiler and desi birds in present study was in agreement with observation of Jadhav and Nikam (2014) who observed an infection rate of 36.07% in Aurangabad, Maharashtra and Mokhtar and Garedaghi (2016) who reported 35.2% infection rate in Iran, and the most prevalent *Eimeria* species were *Eimeria tenella, E. necatrix, E. acervulina* and *E. brunetti*. The *Eimeria* infection in chicken observed in the present study is similar to the reported values (30.18%) by Bachaya *et al.* (2014). The findings of the present study were also in agreement with the observation of Sharma *et al*. (2013), Das *et al*. (2020) and Pooja *et al*. (2021). Low grade of infection with *Eimeria* in chicken has also been reported by Chitradevi (2022) from Coimbatore (12.27%); Vadivoo *et al.* (2020) from Tiruppur (7.66%); Ahad *et al.* (2015) from Kashmir valley (29.87%), and Sharma *et al.* (2013) in Jammu (31.7%). Sharma *et al.* (2015) reported 53.68 per cent of coccidiosis in backyard poultry birds as compared to birds in organised farms (25.55%) which were higher than the observations of the present study.

Incidence of caecal coccidiosis was more (71.7%) as compared as intestinal coccidiosis (28.3%) in both broiler and desi birds. The overall prevalence of (30%) was however not in agreement with the previous observation made by Yousuf *et al.* (2013) who reported 50.89 per cent of coccidial infection in domestic free-range chickens. The variation of incidence might be due

to climatic variations and stocking density (Lawal *et al.,* 2016) management practices, quantum of infection, role of arthropods as mechanical transmitters of coccidian infection and host immunity.

The overall occurrence of coccidiosis in broiler chicken (30.66%) recorded in the present study was less compared to the findings of Kumar *et al*. (2015) in Uttar Pradesh and Uttarakhand (88.24%), Pant *et al*. (2018) in Uttarakhand (60%), Kalita *et al*. (2018) in Assam (62.39%), However, findings of Kumar *et al.* (2023) in Uttar Pradesh (30.96%) on overall incidence of coccidiosis in broiler chicken was close to the present findings. In the present study, the pathognomonic manifestations, like bloody diarrhoea, were more appreciable in broiler birds than in desi and microscopic examination confirmed the presence of either caecal coccidiosis or intestinal coccidiosis. The present findings were also in agreement with observations by Saravanajayam *et al.* (2016) and supported the fact that desi chicken is deemed to be resistant to coccidiosis.

Table 2. Quantitative examination of faecal samples

No of sample examined	McMaster technique	Stoll's technique
1	5900	4650
2	1,83,650	1,35,480
3	81,700	64,100
4	23,500	18,250
5	21,550	18,050
6	29,200	22,550
7	26,300	6300
8	3800	3200
9	7600	6100
10	1,95,900	1,00,100
11	62,200	44,000
12	67,950	51,350
13	68,300	64000
14	35,000	24950
15	5600	3900
16	5000	3250
17	4000	2250
18	99400	51,750
19	8500	6350
20	4250	3000

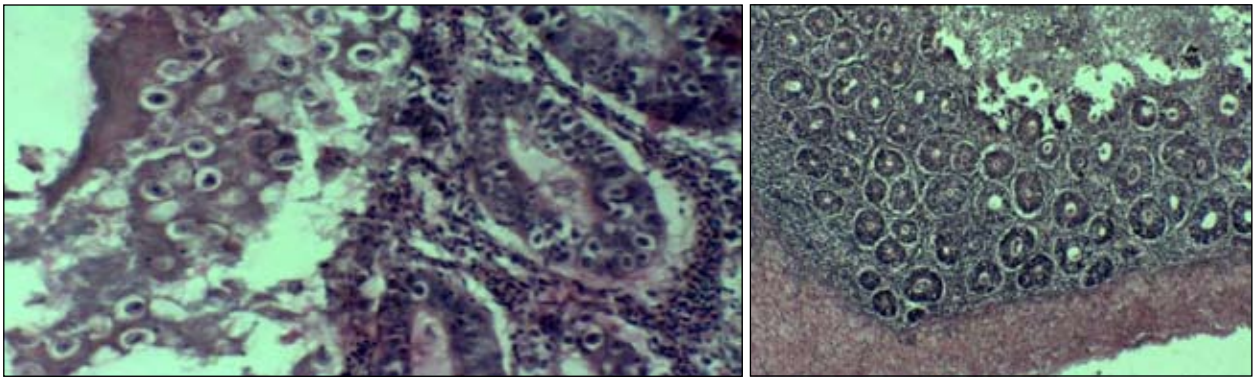
Faecal examination

Qualitative faecal examination revealed that out of 200 GI tracts examined 60 samples were found positive for *Eimeria* oocysts. The highest OPG was 1,95,900 by McMaster technique whereas by Stoll's counting technique the quantum was 1,00,100 for same sample while lowest OPG was 3800 and 3200, respectively, using both the techniques (Table 2).

Histopathological examination

Histopathological studies revealed the presence of developing and developmental stages of *Eimeria* in the lamina propria with desquamation of enterocytes. Epithelial cells of sub-mucosal glands showed massive infiltration of heterophils and mononuclear cells. Congestion, haemorrhages, degeneration and desquamation of cells were noticed. Mild to moderate lymphoid hyperplasia was noticed in cases of caecal coccidiosis (Fig. 4).

The present study revealed the presence of oocysts of *Eimeria* in the lamina propria of the caecum and duodenum with desquamation of enterocytes and infiltration with heterophils and mononuclear cells, which agreed with the findings of Sharma *et al.* (2013). The congestion, haemorrhage, degeneration and desquamation of cells of intestinal mucosa were in agreement with the observations of Jawad and Jasim (2025). Several developmental stages (merozoites, schizonts and gametes etc.) were noticed in the epithelial cells. Similar changes were also observed by Sood *et al*. (2009) and Sharma *et al.* (2013). Infection with *Eimeria* is characterised by parasite replication in host cells with extensive damage to the intestinal mucosa. The developmental stages are found in the epithelial cells of the villi and crypts. The lamina propria or deeper tissues may be parasitized, which may result in necrotic enteritis.



10X **40X**

Fig. 4. Histopathology section of duodenum of chicken showing oocysts of *Eimeria* spp.

The present study highlights the occurrence of coccidia in chicken from Puducherry and emphasises the need for suitable control measures to facilitate this important protozoan parasitic infection.

Conclusion

The occurrence of *Eimeria* in chicken from Puducherry was 30 per cent. The overall *Eimeria* infection in broiler and in desi birds was 30.66 per cent and 28 per cent, respectively. Incidence of both intestinal and caecal coccidiosis was observed in slaughtered chicken. Examination of hemorrhagic and nodular lesions in the GI tracts of both broiler and desi birds revealed the presence of *Eimeria* either in caecal or intestinal forms. Histopathology studies revealed the presence of developing and developmental stages of *Eimeria* in the lamina propria with desquamation of enterocytes and in the epithelial cells and submucosal cells with massive infiltration of heterophils and mononuclear cells.

Conflict of interest

The authors declare that they have no conflict of interest.

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