



Occurrence of poultry coccidiosis in different management systems in Thrissur, Kerala*

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Abstract

Coccidiosis is one of the most prevalent and economically important parasitic diseases caused by the infection with Eimeria species contributing to major economic losses of poultry industry worldwide. In this study, occurrence of Eimeria spp. in chicken reared under different management systems was studied. A total of 300 faecal samples from chicken were collected from six organised poultry farms and six backyard poultry units in and around Thrissur, Kerala. Out of this, 167 faecal samples were from organised farms and 133 from backyard poultry units. All the samples were artificially sporulated and examined for studying the oocysts morphology and morphometry. Out of 167 samples from organised farms 52 were found to be positive for Eimeria spp. while 61 out of 133 samples from backyard poultry were positive. The overall occurrence of Eimeria spp. in chicken from 12 different areas in and around Thrissur was 37.66 per cent (113/300). The species of Eimeria identified on morphological examination were E. tenella, E. necatrix and E. maxima. The occurrence rate of E. tenella was found to be significantly higher (46.01 %) compared to E. necatrix (39.82 %) and E. maxima (14.15 %). The rate of occurrence of Eimeria spp. infection was significantly higher in backyard poultry (45.86 %) compared to that in organised farms (31.13 %).

Keywords: *Eimeria species, chicken, organised farms, backyard poultry.*

The role of poultry industry has been significant in the socio-economic development of the country. The economics of poultry industry is often adversely affected by the faulty management of the farms and outbreak of different diseases. Avian coccidiosis caused by apicomplexan parasites of the genus *Eimeria*, is a major menace for poultry industry causing production losses, high mortality

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and morbidity rates. Seven distinct species of the genus *Eimeria* with different degrees of pathogenicity are recognised in chicken viz., *Eimeria tenella*, *E. necatrix*, *E. maxima*, *E. acervulina*, *E. brunetti*, *E. mitis* and *E. praecox*. Some species of *Eimeria* are highly pathogenic causing severe haemorrhagic enteritis with high mortality in young birds, whereas other species are slightly or moderately pathogenic. During an outbreak of coccidiosis, the identification of the infecting species is usually done by considering clinical signs, sporulation time, oocyst morphology and morphometry. The identification of *Eimeria* species infecting chicken has important implications in studying the epidemiology as well as in disease management. Hence, the present study was undertaken to study the occurrence of *Eimeria* spp. in chicken reared under different systems of management.

A total of 300 faecal samples were collected from chicken reared in organised poultry farms and backyard poultry units in and around Thrissur district of Kerala during the period from June 2019 to December 2020. Out of this, 167 samples were from organised farms and 133 from backyard poultry units. In organised farms, the birds were maintained in deep litter system or cage system, fed with commercial feed and routinely vaccinated against viral diseases. The birds in backyard poultry units were maintained in free range system and were not routinely vaccinated.

The faecal samples were examined by sedimentation and floatation techniques following standard protocols (Soulsby, 1982). Morphological identification of the different *Eimeria* spp. in chicken was done by a combination of morphological features of the oocysts (shape, presence or absence of the micropyle) and morphometry as per Soulsby (1982). The oocysts were artificially sporulated in 2.5 per cent potassium dichromate and the sporulation time was recorded in each case. The occurrence rate of *Eimeria* spp. in chicken and the influence of different systems of management on the occurrence were statistically analysed by Chi square test using SPSS version 24.0.

The overall occurrence of *Eimeria* spp. in chicken from 12 different areas in and around Thrissur was 37.66 per cent (113/300). On statistical analysis, the occurrence rate of coccidiosis in different areas was found to be significantly different ($p < 0.01$) (Table 1). The three species of *Eimeria* were identified based on morphological features, viz., *E. tenella*, *E. necatrix* and *E. maxima* (Fig. 1). The oocysts of *E. tenella* and *E. necatrix* were ovoid in shape whereas that of *E. maxima* were broadly ovoid. On morphometry, *E. tenella* oocysts measured 21 X 18.25 μ with shape index of 1.15, while *E. necatrix* oocysts measured 23.77 X 22.05 μ and had a shape index of 1.07 and *E. maxima* oocysts was 28 X 22.5 μ in size with shape index of 1.24 (Table 2). This concurs with the observations of Khaier *et al.* (2015) who reported the mean size of *E. tenella* oocyst to be 19.63 X 17.02 μ with a shape index of 1.15. Jadhav *et al.* (2011) observed the mean values of *E. necatrix* oocyst measurement to be 13.2 to 22.5 μ length and 11.0 to 18.7 μ width. Al-Gawad *et al.* (2012) observed the mean size of *E. maxima* oocyst to be 29.9 X 23.8 μ with a shape index of 1.25. Similarly, in a study conducted in Tamil Nadu by Rao *et al.* (2013), the mean morphometric values recorded were 22 X 18 μ for *E. tenella* oocysts, 20.8 X 17.5 μ for *E. necatrix* and 31.19 X 18.5 μ for *E. maxima*. The average sporulation time of *E. tenella*, *E. necatrix* and *E. maxima* oocysts was 48-72 h which was in accordance with Soulsby (1982).

On morphological identification *E. tenella* was found to be the most predominant species with an occurrence rate of 46.01 per cent followed by *E. necatrix* (39.82 per cent) and *E. maxima* (14.15 per cent) (Table 3). On statistical analysis using Chi square test, the occurrence rate of *E. tenella* was found to be significantly higher compared to the other two species ($p < 0.01$). The findings agree with many of the previous reports. *Eimeria tenella* was found to be the most prevalent species of *Eimeria* in poultry in a previous study conducted by Gigi George (1997) in Kerala. Similarly, Bhaskaran *et al.* (2010) also reported the incidence of *E. tenella* to be higher when compared to *E. necatrix* and *E. praecox* in Tamil Nadu. In the studies conducted in different farms

Table 1. Occurrence of *Eimeria* spp. in chicken in and around Thrissur

Area	No. of samples examined	No. positive	% positive	p value
Organised Farms				
Poomala	22	-	-	0.0036
Pattikkad	20	12	60	
University Poultry Farm, Mannuthy	32	-	-	
Viruppaka	40	22	55	
Pazhuvil	28	07	25	
Changarakkulam	25	11	44	
Total	167	52	31.13	
Backyard Poultry Units				
Kunnamkulam	30	18	60	0.0036
Arangali	14	-	-	
Thalikkulam	20	17	85	
Madakkathra	20	-	-	
Kuttattukulam	23	15	65.21	
Amballur	26	11	42.30	
Total	133	61	45.86	
Overall Total	300	113	37.66	

Table 2. Morphology, morphometry and average sporulation time of *Eimeria* spp. in chicken

Species	Shape of the oocyst	Micropyle	Mean size of oocyst (μm)	Shape index	Avg. sporulation time (hrs)
<i>E. tenella</i>	Ovoid	Absent	21 X 18.25	1.15	48-72
<i>E. necatrix</i>	Ovoid	Absent	23.77 X 22.05	1.07	48-72
<i>E. maxima</i>	Broadly ovoid	Absent	28 X 22.5	1.24	48-72

Table 3. Occurrence of *Eimeria* species in chicken

Species	No. of samples examined	No. positive	% positive	p-value
<i>E. tenella</i>	113	52	46.01	< 0.0001*
<i>E. necatrix</i>		45	39.82	
<i>E. maxima</i>		16	14.15	

*Highly significant ($p < 0.01$)**Table 4.** Occurrence rate of *Eimeria* spp. in chicken in different management systems

Management system	No. of samples examined	No. positive	% positive	p-value
Organised farms	167	52	31.13	0.0002*
Backyard	133	61	45.86	
Total	300	113	37.66	

* Highly significant ($p < 0.01$)

in Ethiopia, Amare *et al.* (2012) as well as Dinka and Tolossa (2012) reported a prevalence of *E. tenella* to be higher compared to *E. necatrix*, *E. acervulina* and *E. brunetti*.

In the study, the rate of occurrence of *Eimeria* infection was found to be higher in backyard poultry (45.86 per cent) compared to that in organised farms (31.13 per cent) (Table

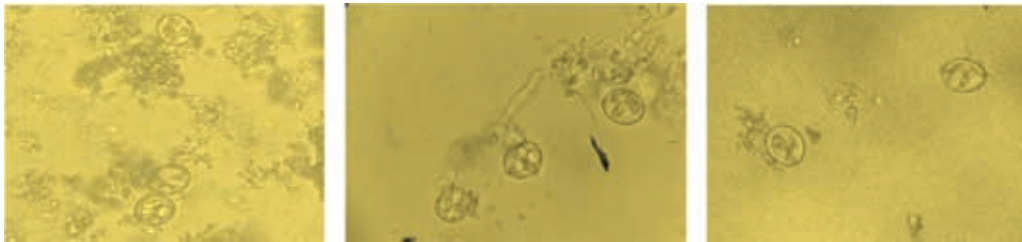


Fig.1. Sporulated oocysts of *Eimeria* spp.

A. Sporulated oocysts of
E. tenella X400

B. Sporulated oocysts of
E. necatrix X400

C. Sporulated oocysts of
E. maxima X400

4). Statistical analysis revealed significant association between the occurrence of coccidiosis and the type of management ($p < 0.01$). The findings were in accordance with Sharma *et al.* (2013) who recorded a higher prevalence rate for coccidiosis in backyard poultry (53.61 %) when compared to organised farms (25.55 %) in Jammu which was attributed to poor management practices and non-use of anticoccidiostats. Similarly, Garbi *et al.* (2015) reported the higher rate of infection in backyard chicken (27.6 %) compared to chicken under intensive management system (11.45 %) in Ethiopia. The higher occurrence rate observed in backyard poultry in this study could be attributed to poor management practices and lesser use of anticoccidials in these birds. Moreover, the humid climatic conditions prevailing in the state favour rapid sporulation of oocysts and quick transmission of disease. However, Ketema and Fasil (2019) reported higher occurrence rate of coccidiosis in intensive management system (20.6 %) compared to that in backyard poultry (17.9%) in Ethiopia and attributed it to the rearing of chicken in deep litter system, which provides optimal temperature and humidity for the sporulation of oocysts. Factors like overcrowding and water leakage also contributed to higher occurrence rate.

Summary

From the present study it could be summarised that the overall occurrence of *Eimeria* spp. in chicken was 37.66 per cent in and around Thrissur. The rate of infection was significantly higher in backyard poultry and the occurrence rate of *E. tenella* was found to be

significantly higher compared to *E. necatrix* and *E. maxima*.

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Conflict of interest

The authors declare that they have no conflict of interest.

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