RESEARCH ARTICLE
JIVA 22 (2) August 2024
https://doi.org/10.55296/JIVA/22.2.2024.42-49

JIVA
OFFICIAL JOURNAL OF INDIAN VETERINARY ASSOCIATION, KERALA

Received on 29/06/2024
Accepted on 09/08/2024

OCCURRENCE OF MIXED INFECTIONS OF *CAPILLARIA* SPP. AND *HETERAKIS* SPP. IN TURKEYS AND ITS CONTROL

Archana P.S.[1*], Athira C.P.[2], Bindu Lakshmanan[3], Syamala K.[4] and Priya M.N.[4]

[1]M. V. Sc. scholar, [2]PhD scholar, [3]Professor and Head, [4]Assistant Professor,
Department of Veterinary Parasitology,
College of Veterinary and Animal Sciences, Mannuthy, Thrissur -680651
Kerala Veterinary and Animal Sciences University

*Corresponding author: archanaanikode@gmail.com

ABSTRACT

Native turkeys kept as domestic bird in rural environments can be infected with bacterial, viral and parasitic agents. Parasites affect health and production of turkeys and cause economic loss. *Capillaria* spp. and *Heterakis* spp. are the major helminths reported to be highly pathogenic for turkeys in both deep-litter systems and free-range systems. The most important role of*H. gallinarum* is its capability of transferring the protozoan *Histomonasmeleagridis*, responsible for infectious enterohepatitis in fowls. Hence the characterisation of species is necessary to adopt proper management and control measures.The present report documents the morphological identification of nematodes collected during postmortem examination of turkeys in a small holder farm at Thrissur.A markedly dilated caecum with severe catarrhal exudates was observed.The examination of intestinal contents revealed parasitic ova along with adult worms. The recovered adult worms were identified as *Baruscapillaria obsignata* and *Heterakis gallinarum*. Faecal sample examination of live birds in the farm also revealed mixed infections. The birds with infection were advised treatment with pyrantel pamoate at a dose rate of 7 mg/kgper orally once.

INTRODUCTION

Poultry industry represents the pinnacle of vertical integration and intensification among animal production industries. In numerous countries around the globe, poultry has emerged as a dominant component of the livestock industry (Udoh *et al*., 2014). The sector encompasses a plethora of domesticated bird species, including chickens, ducks, geese, guinea fowl, and turkeys. Turkey is a large poultry bird, and its popularity among peasant farmers has been increasing in recent times due to its high rate of production, its high feed conversion rate, and the relatively low land requirements necessary for its

rearing. The gastrointestinal tract (GIT) of the turkey is commonly invaded by a range of parasites, including protozoa, nematodes,cestodes and trematodes among which helminth infections are most common (Soulsby, 1982). The presence of parasites in the GIT of turkeys may result in a number of undesirable outcomes including loss of appetite, emaciation, diarrhoea, anaemia, reduced egg production, and retarded growth, all of which have the potential to reduce the economic value of the animals.

Capillariosis is a helminthic infection caused by a large group of trichurid nematodes, comprising approximately 300 species that are distributed globally and parasitise all vertebrates (Barathidasan *et al*., 2014). The avian capillarid worms belong to different genera, including *Baruscapillaria*, *Capillaria*, *Echinocoleus*, *Eucoleus*, *Ornithocapillaria*, *Pterothominx* and *Tridentocapillaria* (Palanivelu *et al*., 2016). These tiny nematodes, commonly referred to as hair worms, are classified within the super family Trichinelloidea, family Capillaridae, and subfamily Capillarinae (Barathidasan *et al*., 2014; Palanivelu *et al*., 2016). These parasites are known to infest various segments of the GIT of domestic poultry, causing severe enteric disease and associated mortality. Helminth infections caused by worms of the genus *Heterakis*, primarily inhabit the interior of the caeca of chickens, turkeys, guinea fowls, quails, ducks, pheasants, and geese. Three species are considered particularly prevalent in poultry *viz*., *Heterakis gallinarum*, *H. dispar*, and *H. isolonche* (Park and Shin, 2010). The most significant role of *H. gallinarum* is its ability to transmit the protozoan *Histomonas meleagridis* that is highly fatal in turkeys.

In this study we describe concurrent infection of *Capillaria* spp. and *Heterakis* spp. in turkeys along with successful control of mixed infection in a small holder turkey farm.

MATERIALS AND METHODS

The present study was conducted in a small holder turkey farm in Thrissur with a history of sudden death of birds. At necropsy, intestine and caecum were collected. Intestinal contents were examined by direct and conventional sedimentation methods. The adult parasites werecollected, washed with normal saline and then cleared withlactophenol.Morphological examination and identification involved morphometry of the eggs as well as dimensional study of the adult parasites (Palanivelu *et al*., 2016: Park and Shin, 2010). The length and width of the eggs and adult worms weremeasured using 10 X objective of microscope (Magnus, MX21iLEDFS121) and depicted in millimetres (mm).

The faecal samples of live birds (n=5) were collected and transported to laboratory for further examination. Sedimentation was carried as per the protocol described by Soulsby (1982) to identify parasite infections.

RESULTS AND DISCUSSION

Markedly dilated intestinal tract stuffed completely with adult parasites and catarrhal exudate was observed at necropsyas reported by Park and Shin (2010). It could be reasonably concluded that the damage caused by these worms to the mucosal layer of the digestive tract impairs digestion and absorption of nutrients, which subsequently resulted in a reduction of appetite and an increased incidence of diarrhoea. In severe cases, this leads to debility, and ultimately death of the affected bird (Palanivelu *et al*., 2016).

Mucosal scrapings and contents when observed under microscope revealed thepresence of adult worms and barrelshaped eggs with prominent bipolar plugs consistent with morphology of *Capillaria* spp. (Figure 1). Ten adult helminths were recovered that resembled nematodes and were further processed.

Eight worms that were thin and hair like revealed a stichosome glandular oesophagus consisting of variable number of stichocytes at their anterior part (Figure 2). The oesophagus of male worms (n=2) were more than half of the whole length of the parasite, while that of females (n=6) were shorter. Theposterior end of male had pseudobursa with a single, long non-spiny spicular sheath and two ventrolaterallobes without caudal alae (Figure 3). The female wormsshowed vulva region at middle of the body and theeggs were having prominent bipolar plugs (Figure 4). Based on these morphological features and location oflesions/predilection site in the host, the parasite was identified as *Baruscapillaria obsignata* as previously documented by Palanivelu *et al*. (2016) in India. Micro morphometric details of egg and adult worms are given in Table 1.*Baruscapillaria obsignata* can be differentiated from other capillarids affecting turkeys based on morphometry (Taylor *et al*., 2016). Enteric capillariosis caused by *B. obsignata* is known to occur in all birds belonging to Anseriformes, Ciconiiformes, Columbiformes, Galliformes, Piciformes and Psittaciformes (Jortner *et al*., 1967; Rickard and Pohl, 1969;Pinto *et al*., 2004; Pinto *et al*., 2008; Yabsley 2008; Park and Shin, 2010; D'Avila *et al*., 2011). In India, Singh *et al*. (2006) and Das *et al*. (2015) have detected capillarid eggs in faeces of few turkey birds. *Capillaria* spp. infections can be highly pathogenic to birds in deep litter or free-range systems where large numbers of infective eggs can accumulate

in litter or soil. (Park and Shin, 2010). These worms are reported to cause lower growth rates, decreased production and reduced fertility in birds (Rickard and Pohl, 1969). The intestinal thickening hasbeen attributed to chronic and repeated infection, high worm load and frequent diarrhoea (Moravec *et al*., 1987). The present study is the first report from Kerala that describes the morphology and morphometry of *B. obsignata* in turkeys.

Table 1. Micro morphometry of egg and adult worms of *Capillaria* spp.

Micrometry parameters	Measurements (mm)	
	Male	Female
Body length	10	15
Body width	0.05	0.042
Spicule length	1.11	
Spicule width	0.02	
Egg length	0.052	
Egg width	0.031	

Two adult female worms medium to large and creamy white were retrieved from caecum along with thick, smooth shelled, ellipsoidal ova. Mouth opening was bordered by tri-radiate lips. The dorsal lip was slightly wider than the sub-ventral lips. Cuticle was distinctly striated. Lateral alae extended along the whole body. The oesophagus was cylindrical and slightly extended toward posterior end with a posterior bulb (Figure 5). Morphometric examination revealed the following characters: Body 10mm long and 0.37mm wide. Oesophagus 0.8 mm long. Nerve ring located at 0.07 mm from the anterior end. Vulva was situated in the middle third of the body at 3.8 mm from the anterior extremity of the body, formed as a transverse slit with indistinct borders. The vagina was short and branched into two diverging uterine branches filled with embryonated eggs. Tail was slender and 0.88 mm long (Figure 6). Based on these morphological and morphometric features as well as location of lesions/predilection site in the host, the parasite was identified as *H. Gallinarum* (Suresh, 2003).The analysed specimens in this study exhibited the general characteristics typically associated with the genus *Heterakis*. With the exception of minor variations in the measurements, the morphological features of the detected nematode species in the current study were found to be in close agreement with those described in the earlier publications by Park and Shin (2010) and Abdel-Gaber *et al*. (2023) on *H. gallinarum*. The discrepancy in measurements may be attributed to the birds from which the parasites were collected and the methods of preparation for examination, which is consistent with the opinion of Al-Moussawi (2016). The helminth is associated with transmission of *Histomonas meleagridis*, a fatal protozoan in turkeys (Park and Shin, 2010). Hence this infection needs to be seriously viewed.

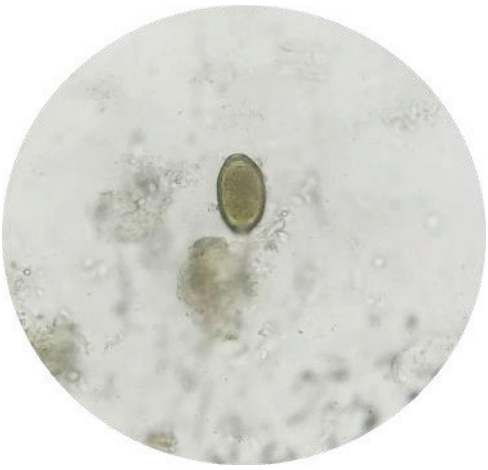

Fig. 1. Barrel shaped eggs with bipolar plugs

Fig. 2. Oesophagus consisting of variable number of stichocytes of *B. obsignata*

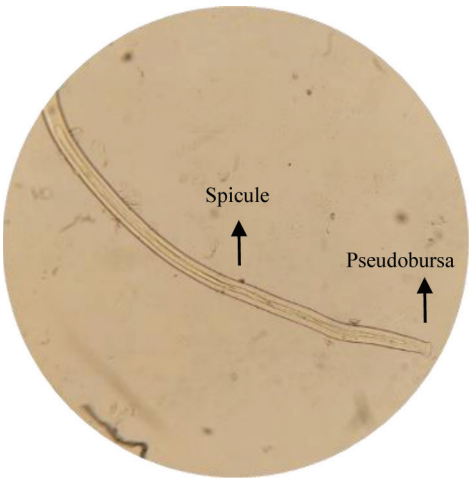

Fig. 3. Posterior end of *B. obsignata* male with single spicular sheath and pseudobursa with two ventrolateral projections

Fig. 4. Female *B. obsignata* showing vulva region and barrel shaped eggs with bipolar plugs in uterus

Fig. 5. Oesophagus with posterior bulb and valvular apparatus of female *H. gallinarum*

Fig. 6. Female *H. gallinarum* tail end

Common anthelmintic drugs like fenbendazole, febantel andlevamisole are considered highly efficacious in avian species (Yabsley, 2008). In this study, faecal sample of live birds from the same flock was examined further which revealed mixed infection. Infected birds were treated with pyrantel pamoate at a dose rate of 7 mg/kg per orally once, which controlled the mortality. Subsequent examination of faecal samples of treated birds after two weeks revealed no parasitic ova.

The morphology and ecology of the parasite has traditionally formed the basis for the taxonomy of nematode parasites (Bobrek *et al*., 2019). However, recent advances in molecular techniques have enabled the development of novel parasitological diagnostic tools, which are more sensitive and specific than conventional diagnostic methods (Tarbiat *et al*., 2021). Further characterisation of species and continued monitoring in farms are important in attaining sustained control of helminth.

REFERENCES

Abdel-Gaber, R., Kamel, R., Maher, S. and Fergani, Y.A. 2023. Morphological and molecular studies of the nematode parasite *Heterakis gallinarum* (Heterakidae) infecting the cattle egret *Bubulcus ibis* (Ardeidae). *Arq. Bras. Med. Vet. Zootec*. **75**: 1096-1106.

Al-Moussawi, A.A. 2016.The nematode Dispharynxn asuta in the white-cheeked bulbul *Pycnonotus leucogenys* in Baghdad city, central Iraq. *J. Entomol. Zool. Stud*.**4**: 422-424.

Barathidasan, R., Singh, S. D., Gowthaman, V., Latchumikanthan, A. and Dhama, K. 2014. The first report of severe intestinal capillariosis caused by *Baruscapillaria obsignata* in farmed helmeted guinea fowls (*Numida meleagris*). *Vet Archiv*. **84**:529-536.

Bobrek, K., Hildebrand, J., Urbanowicz, J. and Gawel, A. 2019. Molecular identification and phylogenetic analysis of *Heterakis dispar* isolated from geese. *Acta Parasitol*. **64**:753-760.

Das, M., Laha, R., Goswami, A. and Doley, S. 2015. Gastrointestinal parasitism in Turkeys and quails of Umiam, Meghalaya. *Indian J. Hill Farming*. **28**:12-13.

D'Avila, S., Bessa, E.C., Souza-Lima, S. and Rodrigues, M.L. 2011. Biased sex ratio and niche restriction in *Baruscapillaria obsignata* (Madsen 1945) (Nematoda, Capillaridae) from

Columbalivia (Aves, Columbidae). *J. Helminthol*. **86**:401-405.

Jortner, B.S., Helmboldt, C.F. and Pirozok, R.P. 1967. Small intestinal histopathology of spontaneous Capillariasis in the domestic fowl. *Avian Dis*. **11**:154-169.

Moravec, F., Prokopic, J. and Shlikas, A.V. 1987. The biology of nematodes of the family Capillaridae. *Folia Parasitol*. **34**:39-56.

Palanivelu, M., Kumar, M.A., Singh, S.D., Latchumikanthan, A., Badami, S., Kolluri, G., Singh, R., Dhama, K. and Singh, R.K. 2016. *Baruscapillaria obsignata*: a serious cause of enteropathy and high mortality in turkeys (*Meleagris gallopavo*). *Vet. Q*.**36**: 145-149.

Park, S.I. and Shin, S.S. 2010. Concurrent *Capillaria* and *Heterakis* infections in zoo rock partridges, *Alectoris graeca*. *Korean J. Parasitol*.**48**: 253.

Pinto, R.M., Brener, B., Tortelly, R., Menezes, R.C. and Muniz-Pereira, L.C.2008. Capillarid nematodes in Brazilian turkeys, *Meleagris gallopavo* (Galliformes, Phasianidae): pathology induced by *Baruscapillaria obsignata* and *Eucoleus annulatus* (Trichinelloidea, Capillaridae). *Mem. Inst. Oswaldo. Cruz*.**103**:295-297.

Pinto, R.M., Tortelly, R., Menezes, R.C. and Gomes, D.C. 2004. Trichurid nematodes in ring-necked pheasants from backyard flocks of the state of Rio de Janeiro, Brazil: frequency andpathology. *Mem. Inst. Oswaldo. Cruz*. **99**:21-726.

Rickard, M.D. and Pohl, R. 1969. Capillariasis in the domestic fowl inNew Zealand. *NZ. Vet. J*. **17**:130-136.

Singh, H., Mishra, A.K and Rao, J.R. 2006. Occurrence of Capillarid eggs in turkeys and Guinea fowls in India. *Appl. Anim. Res*.**29**:7-8.

Soulsby, E.J.L. 1982. Technique. In: Helminths, Arthropods and Protozoa of Domesticated Animals.(7th ed.). ELBS, Bailliere, Tindal and Cassell Ltd.,pp. 765-766.

Suresh, S. 2003. Veterinary Helminthology. (1st Ed.). Directorate of Information and Publications of Agriculture, New Delhi, pp. 299-304.

Tarbiat, B.,Enweji, N. and Baltrusis, P. 2021.A novel duplex DD PCR assay for detectionand differential diagnosis of *Ascaridia galli* and *Heterakis gallinarum* eggs from chicken faeces. *Vet. Parasitol*.**296**: 109499.

Taylor, M.A., Coop, R.L. and Wall, R., 2016. *Veterinary Parasitology*. John Wiley and Sons, Oxford, pp. 70-72.

Udoh, N.A., Luka, S.A. and Audu, P.A., 2014. Prevalence of gastrointestinal parasites of domestic turkey (*Meleagris gallopavo* Linnaeus 1758) slaughtered in Kaduna metropolis, Kaduna State, Nigeria. *J. Nat. Sci*. **4**:105–109.

Yabsley, M.J. 2008. Capillarid nematodes. In: *Parasitic diseases of wild birds*. Wiley-Blackwell, Ames, Iowa,USA, pp. 463-497.