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The prevalence and pathology of *Raillietina cesticillus* in indigenous chicken (*Gallus gallus domesticus*) in the temperate Himalayan region of Kashmir - short communication

Sheikh T. Salam[1], Masood S. Mir[2]*, and Abdul R. Khan[1]

[1]*Department of Zoology, University of Kashmir, Hazratbal, Srinagar, Kashmir, India*

[2]*Division of Veterinary Pathology, Faculty of Veterinary Sciences and Animal Husbandry, SKUAST-K, Shuhama, Srinagar, Kashmir, India*

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ABSTRACT

Research was undertaken into *Raillietina cesticillus* infection in scavenging indigenous chicken in the Kashmir valley from January 2005 to December 2006. A total of 478 birds of different age groups and both sexes were randomly selected from 10 villages and screened through clinical, parasitological and pathoanatomical examinations. The study indicated that 23.22% (111/478) of the chicken were infected with *R. cesticillus* either singly or in association with other parasites - *Amoebotaenia sphenoides, Raillietina tetragona* and *Choanotaenia infundibulum*. Annual occurrence of the infection was found to be 24.03% (56/233) and 22.44% (55/245). There was a marked seasonal difference in load and mean intensity of infection. A histologically variable degree of degenerative changes was observed with more severe changes in heavy infestation. The inflammatory reaction was characterized by predominant infiltration of heterophils and lymphocytes.

Key words: domestic fowl, *Raillietina cesticillus*, prevalence, pathology

Introduction

The organic or traditional system of poultry rearing in Kashmir often suffers heavy production losses, impaired health and mortality due to infections, infestations and predation (HASSOUNI and BELGHYTI, 2006). The prevalence of poultry parasites in Kashmir has not been studied extensively. The few studies carried out document high prevalence rates for helminth parasites (FOTEDAR and KHATEEB, 1986; PANDIT et al., 1991; GANAIE et al., 2004). Cestodes recorded from traditional poultry include the *Raillietina*

*Corresponding author:

Dr. Masood S. Mir, Division of Veterinary Pathology, Faculty of Veterinary Sciences and Animal Husbandry, Sher-e-Kashmir University of Agriculturae Sciences and Technology of Kashmir, Shuhama- 190 006, Srinagar, Kashmir, India, Phone: +91 946 907 7920; +91 194 242,2162 (R); Fax: +91 194 226 2536 (O); E-mail: masoodmir1@gmail.com

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tetragona, R. echinobothrida, Choanotaenia infundibulum, Amoebotaenia sphenoides, Hymenolepis carioca, Cotugnia diagonopora, and *Davainea* species.

Infection by cestodes in domestic fowl is not a fulminating disease with high mortality. However, the harm done through an insidious and chronic process in the population as a whole brings about the total loss. *Raillietina cesticillus* is a common tapeworm of backyard poultry. Experimental and spontaneous studies have shown it to be quite pathogenic (BHOWMIK et al., 1982). Its pathobiological effects depend on the parasitic load, which varies with epidemiological conditions. Detailed studies on prevalence and pathology of *R. cesticillus* in the agroclimatically temperate zone of Kashmir valley are lacking. Therefore, an attempt has been made to observe the prevalence trends of cestodes and the extent of damage caused in naturally infected indigenous fowl reared in backyard and range.

Materials and methods

Study area and sampling. The cross sectional study was carried out in the villages of Bandipora, Sopur, Ganderbal, Sonamarg, Hazratbal, Nawakadal, Chari-Sharif, Shopiyan, Kokernag and Pahalgam, to make it representative of the Kashmir valley. A total of 478 domestic fowl of different age groups and of both sexes were randomly selected from the area under study over a two period from January 2005 to December 2006. No more than two birds were purchased from a single household during the entire period of study.

Parasitological examinations. Post mortem examinations were performed by standard methods. Briefly, after decapitation, the entire gastrointestinal tract was collected from each bird. The gastrointestinal tract was opened in a longitudinal section and the contents were carefully washed through a test sieve. The mucosa was scraped in order to collect the cestodes embedded in the mucosal layer. Finally, the contents were also examined under a microscope for locating any larvae or egg invisible to the naked eye. All cestodes were counted before being fixed. Permanent slides of the scolices were prepared to identify the cestodes as per SOULSBY (1982).

Histopathological examinations. After recording the gross changes, pieces of intestines from the infected birds were collected and fixed in 10% buffered formol saline, processed for paraffin embedding and 4-5 μm sections cut and stained by the Harris haematoxyline and eosin method (BANCROFT and GAMBLE, 2002).

Scanning electron microscopy. Pieces of the intestines with the parasites embedded in the mucosa were washed in PBS and fixed in 4% glutraldehyde solution in cacodylate buffer at pH 7.4 for 4 hours at 4 °C followed by graded dehydration to absolute ethanol. Then the specimens were dried by critical point drying using liquefied CO_2 at a pressure of 75kg/cm^2 and temperature 32 °C in a critical point dryer, Hitachi model HCP-2, coated with gold by thermal evaporation carried out in a vacuum evaporator, Hitachi model

HUS-5GB, at a pressure of 10^{-6} torr, and examined by a scanning electron microscope, Hitachi model S-3000H at various accelerating voltages and magnifications.

Results

Prevalence. The study revealed that 23.22% (111/478) birds examined over a period of two years, from January 2005 to December 2006, harbored *R. cesticillus* and the annual prevalence was recorded as 24.03% and 22.44% for the first and second year respectively. The mean monthly prevalence ranged from 5.55% to 41.66% and was highest during July to September. The seasonal pattern revealed the highest prevalence during the summer (33.62%) followed by the autumn (28.92%), spring (19.65%) and winter (11.29%) in that order (Table 1). Also the parasite load and mean intensity of infestation was higher from late summer to mid autumn. Concurrent infestation with other parasites, viz. *Amoebotaenia* and *Chonotaenia* was observed in some cases.

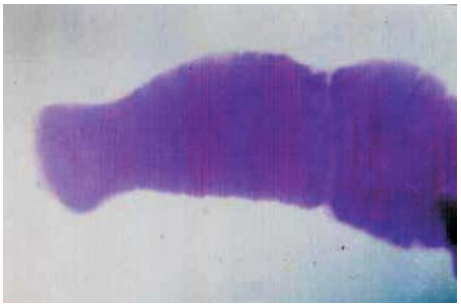

Fig. 1. Scolex of *Raillietina cesticillus* collected from domestic fowl (*Gallus gallus domesticus)*.

Fig. 2. Scanning electronmicrograph revealing *Raillietina cesticillus* boring into intestinal mucosa and villous atrophy.

Gross and microscopic observations. In the affected birds, the duodenum and jejunum contained greenish or yellowish faeces with a very soft to liquid consistency and containing much mucous exudate. Necrotic foci in the mucosa marked points of parasitic attachment. In cases with a higher number of parasites and those revealing parasitic associations, the mucosa was thickened and also revealed mottling with petechiae. Robust cestode parasites were observed either free or anchored firmly to the mucosa with the help of scolex. The parasites were later identified as *Raillietina cesticillus* on the basis of structural characteristics (Fig. 1). *Amoebotaenia* could be observed in the duodenal and upper jejunal scrapings. Scanning electron microscopy revealed parasites attached to the intestinal wall with the scolex embedded deep into the mucosa. The intestinal villi appeared to be broadened and flattened (Fig. 2).

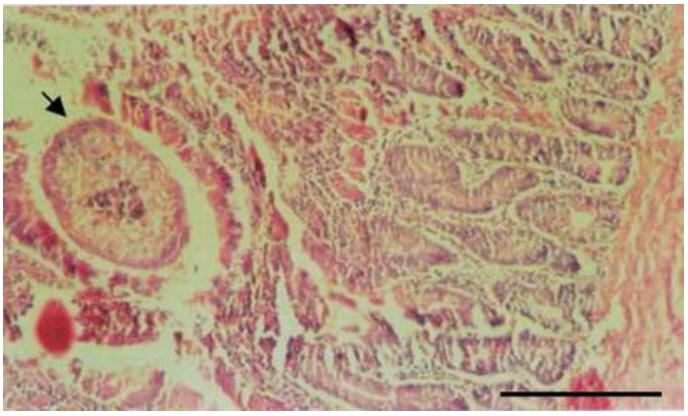

Fig. 3. Photomicrograph of the intestine from domestic fowl revealing transverse section of *Raillietina cesticillus* (arrow) associated with degeneration and disintegration of villi and mucosal glands along with heterophilic infiltration. Scale bar = 200 µm.

Table 1. Month wise and seasonal occurrence of *R. cesticillus* in domestic fowl for the year 2005 - 2006

Month	2005			2006			Total			Seasonal
	Number screened	Positive		Number screened	Positive		Number screened	Positive		
		No.	%		No.	%		No.	%	
Dec.	22	2	9.09	23	1	4.34	45	3	6.66	Winter 14/124 (11.29%)
Jan	20	2	10.00	20	2	10.00	40	4	10.00	
Feb.	16	3	18.75	23	4	17.39	39	7	17.94	
March	18	0	0	18	2	11.11	36	2	5.55	Spring 23/117 (19.65%)
April	19	5	26.31	20	3	15.00	39	8	20.51	
May	23	7	30.43	19	6	31.57	42	13	30.95	
June	21	4	19.04	23	6	26.08	44	10	22.72	Summer 39/116 (33.62)
July	17	6	35.29	19	8	42.10	36	14	38.88	
Aug.	15	7	46.66	21	8	38.09	36	15	41.66	
Sept.	20	9	45.00	19	7	36.84	39	16	41.02	Autumn 35/121 (28.92)
Oct.	18	6	33.33	18	4	22.22	36	10	27.77	
Nov.	24	5	20.83	22	4	18.18	46	9	19.56	
Jan. to Dec.	233	56	24.03	245	55	22.44	478	111	23.22	

Histologically, sections of the parasite were observed in the lumen as well as deep in the mucosa. At places mucosal plugs were observed drawn inside the rostellum, which formed a cup-shaped appearance. Lesions to the intestines were characterized by varying degrees of degenerative changes to sloughing of mucosa in heavy and multiple infestations. In cases with higher parasitic load, partial villous atrophy with broadened surface and increased vascularity was observed in the duodenum and jejunum. At the site of parasitic attachment, the epithelium and glands were disintegrated. The inflammatory reaction was characterized by predominant heterophils, especially in the areas of mechanical damage by scolices. Sparse infiltration of mononuclear cells, chiefly lymphocytes, and eosinophils was observed throughout the mucosa, especially in the lamina propria (Fig. 3). Infiltration was not observed in muscularis or serosal layers. In cases with parasitic associations, sections of other cestodes were observed in the disintegrated mucosa.

Discussion

The parasite was found to be prevalent throughout the year with higher prevalence, as well as parasitic load, during late summer to mid autumn, when temperature and humidity were comparatively higher. Similar findings have been reported by other workers from this area (FOTEDAR and KHATEEB, 1986; PANDIT et al., 1991) and other places (HASSOUNI and BELGHYTI, 2006; ABDELQADER et al., 2008). The overall prevalence however differed among the previous reports, as well as when compared with the present observation. This may be attributed to differences in the geographical areas and periods of study. High ambient temperature and high relative humidity may favor infection by lowering the birds' resistance, whereas lower temperatures during the winter causes arrested development of parasites in hosts and the environment. The increased availability of intermediate hosts in the rainy season for the completion of the life cycles of parasites may also be one important factor responsible for the high rate of infection during the summer months.

The histopathological findings suggested load dependent mild to moderate enteritis. The histopathological observations corroborated the findings of earlier workers (BHOWMIK et al., 1982). In general, the degree and extent of enteric changes corresponded to the parasitic load. Attachment of the parasite caused traumatic lesions which might favor secondary bacterial infection and hence more severe cellular reaction in the area. Eosinophils have been incriminated for a range of immunomodulatory effects favoring parasite survival in humans (LÖSCHER and SAATHOFF, 2008), however delineation of local effects and species specific studies are needed. The higher prevalence of the parasites and observed pathology directly reflects their economic importance and warrants conscious intervention for its control in backyard and range poultry.

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SAŽETAK

U radu je prikazana prevalencija trakavice *Raillietina cesticillus* u domaće kokoši na području Kašmirske doline u razdoblju od siječnja 2005. do prosinca 2006. Ukupno je pretraženo 478 kokoši različite dobi i spola. Kokoši su nasumično sakupljene na području 10 sela. Za svaku je kokoš zabilježen klinički, parazitološki i patoanatomski nalaz. Istraživanjem je dokazano da je 23,22% (111/478) kokoši bilo invadirano istom trakavicom. U nekih životinja osim ove trakavice dokazane su i druge trakavice poput *Amoebotaenia sphenoides*, *Raillietina tetragona* i *Choanotaenia infundibulum*. Godišnja učestalost trakavice *R. cesticilus* iznosila je 24,03% (56/233) i 22,44% (55/245). Dokazana je i razlika u sezonskoj učestalosti i to u odnosu na broj trakavica i prosječan intenzitet invazije. Izraženije patohistološke promjene dokazane su u ptica s većom invazijom. Upalni se infiltrat pretežito sastojao od neutrofila i limfocita.

Ključne riječi: perad, *Raillietina cesticillus*, prevalencija, patologija