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Studies on prevalence and pathology of *Ascaridia columbae* in wild and domestic pigeons of Kashmir valley

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ABSTRACT

A two year study was carried out from January 2014 to December 2015 on prevalence and pathology of nematode *Ascaridia columbae* in both wild Blue Rock Pigeons (*Columba livia livia*) and domestic pigeons (*Columba livia domestica*) of Kashmir valley. A sample size of 551 pigeons (276 wild pigeons and 275 domestic pigeons) of both the sexes collected from different localities covering almost entire Kashmir valley were selected for the present study. The infected intestines were preserved in formalin (10%) for histological studies. The study clearly revealed that prevalence rate of *Ascaridia columbae* for 1st Year of study (2014) was 7.2% (19/262) and for the 2nd Year (2015) it was 6.5% (19/289) giving an overall prevalence rate for a two year study i.e from Jan 2014 to Dec 2015 as 6.8% (38/551).The highest occurrence of nematode was observed during September with an overall prevalence rate of about 15% (8/54) for September months of two years of study. Range of intensity of worms was found to be 1 – 7 with an overall Mean intensity of infection observed to be 02 ± 1.2. Histological findings revealed presence of adult worms in the lumen of intestine along with cellular debri and the infected tissue showed intense chronic diffuse inflammatory processes with mononuclear and polymorphonuclear (heterophils) leucocyte infiltrations extending up to submucosa. There was distortion of villi, sloughing off of the epithelium and lumen was packed with fibrin, red blood cells and tissue debris.

Key Words: Prevalence; Pathology, Ascaridia Columbae, Pigeons, Kashmir Valley

I.INTRODUCTION

Pigeons are highly mobile and forage in a variety of locations and habitats increasing their opportunity of exposure to a wide range of parasites and their close interactions with other birds can be of concern, since pigeons might serve as a potential reservoir of parasites, with the capacity to spread them to wild birds, including threatened species [1, 2] and poultry birds [3]. One such frequently occuring nematode parasite of pigeons is *Ascaridia columbae*, which is responsible for causing Ascariasis in pigeons causing great economic losses to pigeon breeders and posing potential threat to spread to other economically important birds. *Ascaridia* worms have direct life cycle**.** Adult female worms in the small intestine pass eggs with the feces. Once in the environment infective larvae develop inside the eggs in about 12-15 days [4]. Such eggs can remain infective in the birds' litter for one year and longer. They do not develop

at temperatures below 12°C, but may survive slight frost. Earthworms can ingest large amounts of infective eggs and act as mechanical vectors. Birds become infected after eating infective eggs, either directly with contaminated food or water, or indirectly through infected earthworms. Ingested eggs release the larvae in the gut's lumen where they molt and remain for about 10 days. Subsequently they penetrate into the gut's lining and can migrate to different visceral organs like liver, heart and lungs causing tissue pathologies to these visceral organs before returning to the gut's lumen where they complete development to adult worms and can concentrate in the anterior part of intestine in huge numbers causing severe pathologies to the intestinal tissue besides robbing food causing deficiency diseases and increased mortality in the birds. Despite being economically important parasite, little work has been carried out on the pathology caused by *Ascaridia columbae* in pigeons. Hence the present study was designed to have hands on information about prevalence of this nematode and the pathological changes brought about in the intestinal tissue by this nematode.

II.MATERIALS AND METHODS

2.1Prevalence

A total number of 551 guts of pigeons (275 domestic pigeons and 276 wild pigeons) collected from different regions covering almost entire Kashmir valley were examined for the parasites. Prevalence was recorded on the basis of (a) Incidence rate (b) Mean intensity (c) Season wise infection (d) Sex wise infection and (e) Age wise infection. The pigeons were necropsied and the gastrointestinal tracts were removed and surveyed for parasites under a stereomicroscope. Any nematodes that were found were preserved in 70% ethanol, cleared with lactophenol and identified based on Vicente et al. (1995) [5]. All adult worms were identified directly under the microscope. The identification key of Soulsby (1982) was adopted [6]. Prevalence was calculated as a percentage of the host population infected at a point in time (Thrusfield, 1995) [7]. Mean intensity was calculated as number of parasites per infested bird.

2.2Pathological studies

For histopathological studies the infected intestinal tissues were fixed and preserved in 10% formalin, processed through conventional technique [8] for paraffin embedding and then sectioned at 4-5 microns in thickness. The sections were then stained with Haematoxyline and Eosin and then studied under microscope.

III.RESULTS AND DISCUSSION

3.1Prevalence

Ascaridia columbae is relatively smaller and having longer spicules than its related species *Ascaridia galli* found in chicken (Fig 3). Annual prevalence of 7.2% (19/262) and 6.5% (19/289) for *Ascaridia columbae* was recorded during the 1st and 2nd year of study giving an overall prevalence rate of 6.8% (38/551) which is comparatively

lower than prevalence rates in other parts of India like 33.3% Andra Pradesh [9] (Sivajothi S, Sudhakara RB, 2015), 76.66% in Nagpur [10] (Borghare et al, 2009) which can be attributed to comparatively colder climatic conditions in Kashmir valley compared to rest of India. The lower prevalence (6.8%) of the present study is in line with the study from other parts of world having moderate climate like 4% in South West of Ilam province, Iran [11], 16% in Brazil [12]. The highest occurrence of nematode was observed during September months of both the years of study i.e 11% (3/26) for September 2004 and 18% (5/28) for September 2005, giving an overall prevalence rate of about 15% (8/54) for September months of the study (Figure 1). Range of intensity of worms was found to be 1 – 7 with an overall Mean intensity of infection observed to be 02 ± 1.2.Highest mean intensity was observed during Summer (Fig 2). Females were found to be more infected (7.6%) than the males (6.1%) (Table 1).The observations in pigeons as recorded in the current study are in agreement with the reports of various workers from India and outside. Parsani *et al.* (2002) who after working on the incidence of parasitic infection in pigeons in Gujarat got almost similar results on the prevalence of the endoparasites with higher prevalence values in warmer months [13]. Minor differences in the results of the present study could be explained on the basis of seasonal, managemental, climatic variations and also due to variation in parasitic population of different localities where the birds were exposed. Our observations are also clearly in line with the observations of Fotedar and Khateeb (1986) who also recorded the highest incidence of helminth infection in the chicken in Kashmir valley during the month of September and lowest in the months of December and January and a decrease in the incidence and mean worm burden with decreasing temperature and rainfall [14]. The reason behind the heavy infection during the warm and wet months may be high mean temperature and high relative humidity which lowers the resistance of birds and favours heavy infection [15] and lower rate of infection during winter season might be attributed to low temperature which also may help in arrested development of parasites in host and environment [16].The increased availability of intermediate hosts in the rainy seasons for the completion of life cycles of parasites may also be one important factor responsible for high rate of infection during summer months.

3.2Pathology

Ascaridia columbae were found to inhabit lumen of the intestine. The worms were of varying sizes. Gross changes observed depended on the parasite load. In most of the cases, low load of worms was observed and was not associated with any grossly observable lesions. Moderate infection was associated with mucous enteritis. The intestinal wall appeared to be thickened with mucosa giving a velvety appearance. Lumen contained thick white pasty mucous. Heavy infection of *Ascaridia columbae* causes mild catarrhal enteritis, obstruction (Figure 5). Histopathological sections of the parasites were found in the lumen (Figure 6).The histopathological lesions varied from degeneration of lining epithelium to sloughing of mucosa. Mucous degeneration and disruption of villi was a consistent feature (Figure 4). Cellular reaction was mild and was characterized mainly by mononuclear cells and a few polymorphonuclear cells including eosinophils. At places local mononuclear infiltration was observed in muscle

layer (Figure). Histological studies of infected tissue revealed similar results as obtained by other workers while working on histopathological aspect of the tissue in pigeons infected with helminth parasites [17] [18].

Table 1: Age wise and sex wise proportional incidence of Ascariasis in pigeons

Point of consideration	Wild pigeons	Domestic pigeons	Total pigeons
No. of guts examined (Males/Females)	276 (138/138)	275 (137/138)	551 (275/276)
No. of guts infected (Males/Females)	18 (8/10)	20 (9/11)	38 (17/21)
Infection rate (%) (Males/Females)	6.5 (5.7/7.2)	7.2 (6.5/7.9)	6.8 (6.1/7.6)

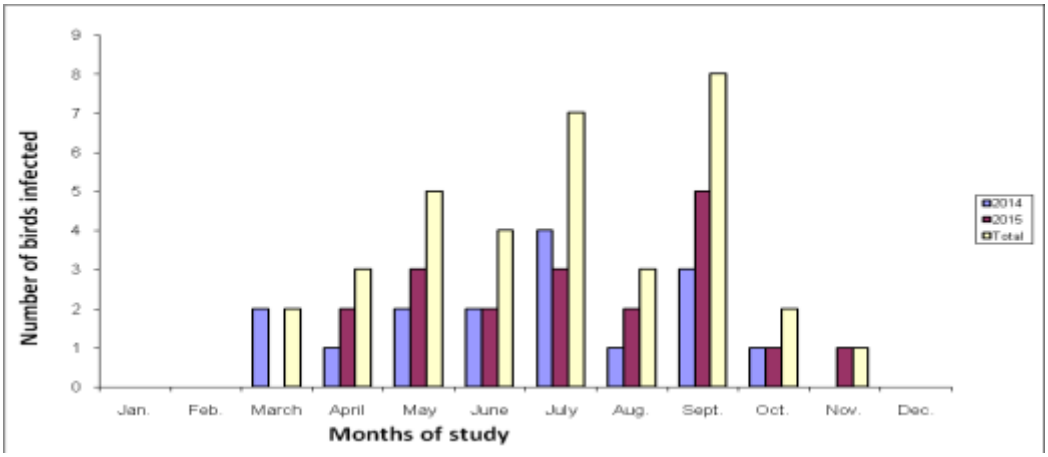
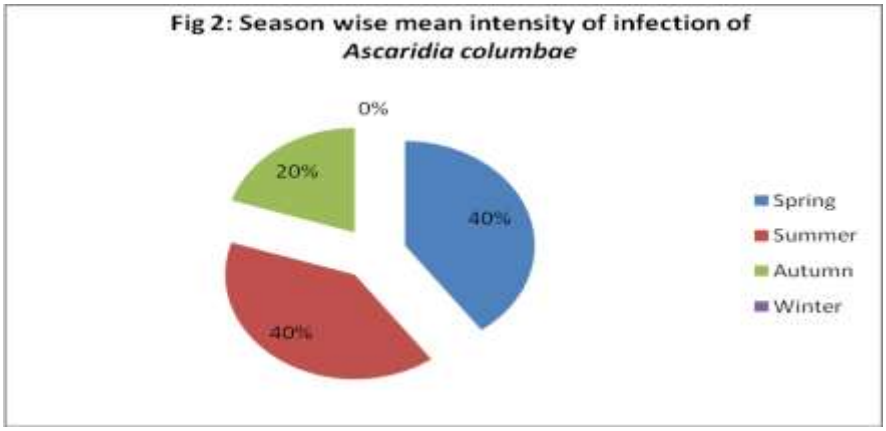


Fig 1: Monthwise prevalence of *Ascaridia columbae* in pigeons



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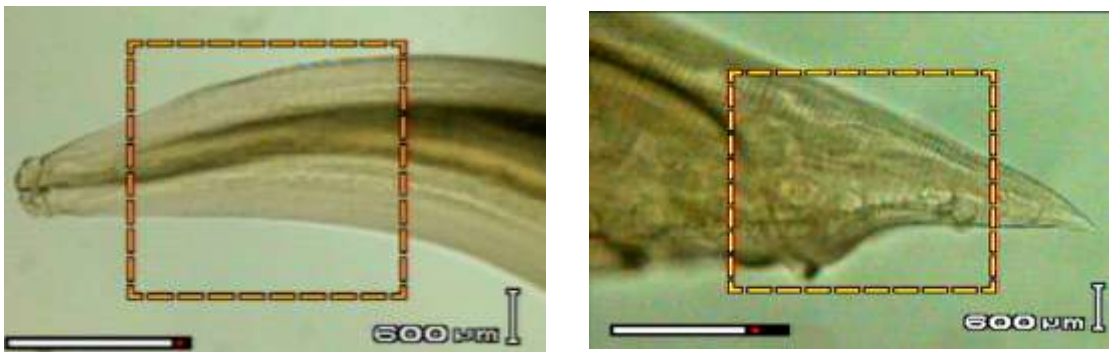

Fig 3. *Ascaridia columbae:* a) anterior end revealing three pairs of lips b) posterior end with spicules.

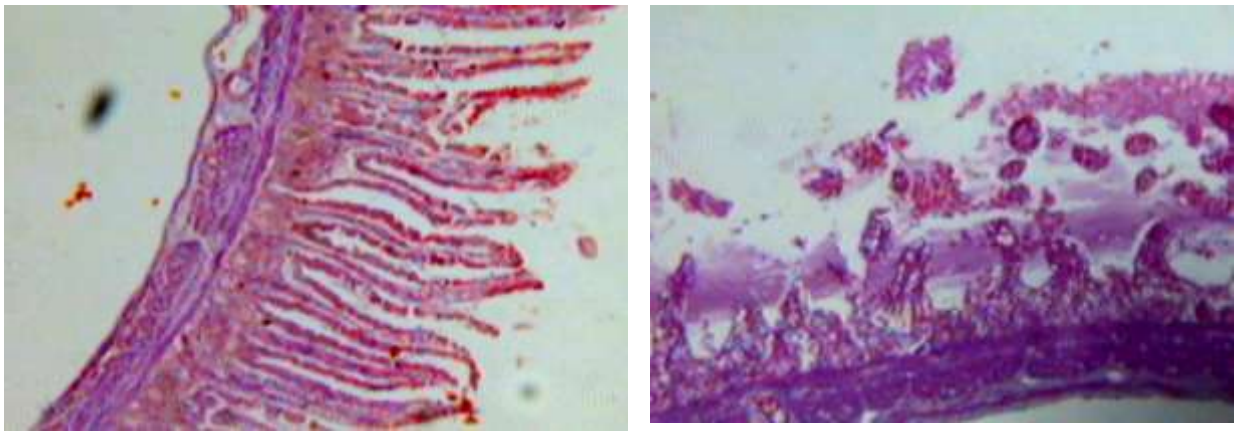

Fig.4. a) Normal uninfected intestine b) pigeon intestine infected with *Ascaridia columbae*

Fig.5. *Ascaridia columbae* blocking the intestinal lumen of pigeon

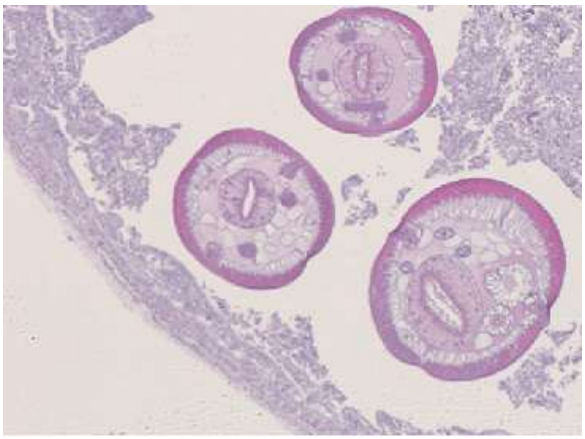

Fig 6. T. S. of intestine of pigeon showing sections of *Ascaridia columbae* in the lumen and infiltration of polymorphonuclear cells

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