

Co-Infection of Domestic Pigeons with Newcastle Disease, Round Worms and Cestodes in District Faisalabad, Pakistan

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Abstract: A total of 101 pigeon farms were visited during a period of six months (August 2013 to January 2014) to determine the point prevalence of Newcastle Disease (ND) and concurrent co-infection of endoparasites in district, Faisalabad. Pigeons manifesting specific clinical signs of ND were purchased and subjected to human slaughtering followed by postmortem examination. The Sera were harvested from the blood of the clinically sick birds. Visceral organs exhibiting lesions were collected for histopathological examination. Fecal samples per rectum of affected birds were also collected and processed to diagnose the round worm infestation. A sum of 82 % naturally infected pigeons showing clinical signs were found serologically positive for ND. The point prevalence of ND in pigeons and simultaneous co-infection of endoparasites were recorded as 10% and 10.5% respectively. Based upon the results of this study, it could be concluded that coexistence of ND roundworm and cestodes worms infestation is prevalent in pigeons of district Faisalabad.

Key words: Pigeons • Newcastle Disease • Round Worms • Cestodes worms • Serology • Histopathology

INTRODUCTION

Pigeons are ubiquitous flying birds belonging to order columbiformes [1]. The tradition of pigeon rearing in Indian subcontinent is traced back to Mughal era, when pigeons were primarily used as postal messengers. Nowadays, domestic pigeons are commonly raised for racing, fighting and exhibition purposes in many cities of Pakistan including Faisalabad. Moreover, the nutritional and therapeutic values of pigeon meat further enhance their utility. A variety of diseases affect pigeons but viral diseases predominate in terms of high morbidity and mortality [2]. Newcastle disease (ND) has been reported in chickens, pigeons, turkeys, partridges, pheasants, doves, sparrows, geese, starlings and other free flying birds [3]. ND is an important, highly contagious and infectious disease of pigeons [4] caused by pigeon

paramyxovirus serotype I (PPMV-1), a variant of avian paramyxovirus serotype I (APMVI-1) [5]. Based upon the degree of virulence, AMPV-1 is further classified into three pathotypes i.e. lentogenic, mesogenic and velogenic [6]. During the course of disease, the virus causes sub mucosal to ecchymotic hemorrhages in proventriculus and intestine. Round worms commonly infect adult pigeons causing clinically asymptomatic infection. Helminth parasites including nematodes, cestodes and trematodes inhabit the gastrointestinal tract and other visceral organs of pigeons thereby instigating huge morbidity. Endoparasitic infection is characterized by anorexia, loss of general body condition and poor growth performance, ultimately predisposing the affected birds to viral and bacterial pathogens [7]. Among the helminth parasites infesting pigeons, round worms are considered to be most widespread. Furthermore, endoparasitic

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infestation can induce immunosuppression subsequently predisposing the affected birds to bacterial and viral infection. The urban population associated with keeping and breeding of pigeons usually possesses insufficient knowledge concerning the pathological and therapeutic aspects. Accordingly the health and husbandry matters of pigeons require particular consideration. Therefore, this project was planned to study the co-infection of pigeons with ND virus and round worms in district Faisalabad.

MATERIALS AND METHODS

Field Survey and Examination: During August 2013 to January 2014, a total of one hundred and one, randomly selected, pigeon farms were visited in and around Faisalabad. During the survey, prevalence of Newcastle disease alone and combined with round worms in pigeons was evaluated. Clinical signs, morbidity and mortality rates were also recorded throughout the examination. The data was documented using a specially designed performa for recording the number of birds, general history, management, previous disease, vaccination and treatment etc. Recently dead birds or birds showing peculiar clinical signs of ND were subjected to postmortem examination in the Diagnostic Laboratory, Department of Veterinary Pathology, University of Agriculture, Faisalabad. Fecal samples of the pigeons were collected per rectum for investigation and confirmation of roundworm ova by using floatation technique. [8]. Organs with typical lesions were collected for histopathological studies [9]. About 3 ml of blood was collected from clinically sick birds for serum separation. Sera were harvested and used to determine the antibody titer against PPMV-1 and APMV-1 by hemagglutination inhibition test [10]. Data were analyzed by means of descriptive statistics [11].

RESULTS

Survey and Examination: During this study 101 pigeon farms were selected at random from different locations in Faisalabad and only 10 pigeon farms were found to be positive for ND. The recorded point prevalence of ND in different locations has been shown in Table 1.

The cumulative prevalence of ND in Faisalabad was estimated to be 10% using the formula given by Thrusfield [12] i.e.

$$\text{Prevalence of disease in particular area} = \frac{\text{Number of diseased animals}}{\text{Total number of animals at risk}}$$

Most of the clinical signs observed during the study included torticolous, wing and leg paralysis, blindness, neck and head shivering (tremors) and greenish white mucoid diarrhea. These signs along with respective percentages have been illustrated in Table 2.

Overall 40 birds were examined out of ten farms found positive for ND. The major gross lesions observed during postmortem examination included pale discoloration of liver, kidney enlargement, accumulation of greenish material in the gizzard, splenomegaly and hemorrhages in brain and intestine (Table 3). Nevertheless, grossly apparent lesions throughout the respiratory tract of ND infected pigeons were absent.

Histopathology: Proliferation of fibrous connective tissue (FCT) was evident in the liver parenchyma and mononuclear cells were infiltrated in the centro-lobular areas. Hydropic degeneration and fatty changes were observed in hepatocytes as described by Seham, [36]. Cellular details were not clear in the peripheral areas of the hepatic lobules. Cells lining the proximal convoluted tubules were found to be hypertrophied which ultimately resulted in narrowing of their lumens. Some area showed infiltration of inflammatory cells. Cortical area of the kidneys was found fibrosed and ultimately led to pressure atrophy of glomerulus of some cortical areas. Homogenous appearance of cells lining the distal convoluted tubules and loss of their nuclei were found. Proventriculi of the infected birds were fibrosed and most of the intestinal villi were found misshapen with sloughed off lining epithelium. Vessels in the lamina propria of the villi were found dilated and congested and the cells lining the crypts of Lieberkuhn were hypertrophied in pigeons suffering from parasitic infestation.

Confirmation by HA and HI: Out of 40 clinically sick pigeons, only 28 were found to be positive for the antibodies against NDV (Table 4). Haemagglutinating activity indicated that the birds were suffering from ND. For the HA and HI procedure, 0.5 % of RBC suspension was made. And the antigen (vaccine) was of 128 4HA unit.

Fecal sample and intestinal contents of only one sample was positive for roundworms and two samples were positive for cestodes. This study indicated that roundworm and cestodes infestation in ND infected pigeons was about 2.5% and 5% respectively.

Table 1: Point prevalence of ND in different locations

Colony	No. of farms	Diseased Farms	Prevalence (%)
Gulam Muhammad Abad	55	4	7
Guraanak Pura	15	1	6
Partab Nagar	10	0	0
Ayub Colony	7	0	0
Jhang Bazar	6	2	33
Choti Unasi	3	2	66
Gulistan Colony	3	1	33
Yunous Town	2	0	0

χ^2 values = 4.693

d.f = 6

p = 0.584 (N.S)

Total number of visited pigeon farms= 101.

Table 2: Clinical sings observed in ND-infected pigeons

Clinical sings	No. of birds	Percentage
Torticollis	14	35
Neck shivering	6	15
Wing paralysis	4	10
Leg paralysis	6	15
Blindness	14	35
Diarrhea	40	100

Table 3: Postmortem lesions observed in ND-affected pigeons

Lesions	Number of birds	Percentage
Haemorrhages in intestine	2	5
Haemorrhages in brain	2	5
Pale discoloration of liver	40	100
Enlarged kidneys	40	100
Greenish discoloration of gizzard	34	85
Splenomegaly	14	35

Table 4: Co-infection with Newcastle Disease, Round Worms and Cestode Worms

Total Sick samples	+ve ND samples	+ve Round worm	+ve Cestodes
40	28 (70%)	1 (2.5%)	2 (5%)

DISCUSSION

During the study a survey of pigeon farms was conducted to determine the point prevalence of ND in pigeons in Faisalabad city. At the same time the birds were examined for the concurrent occurrence of roundworm infection. Pigeons are one of the few domesticated birds which are kept by the human for variety of purposes such as food (meat), entertainment, racing, communication (delivery of letters in old times) and treatment of various diseases in human like facial paralysis. ND is globally distributed avian disease that can cause severe economic losses in commercial poultry [13]. ND in pigeon is characterized by sudden onset of restlessness, in- appetite, nervous manifestation and inability to fly. Morbidity and mortality averages 100% & 80% respectively [14].

On the basis of green mucoid diarrhea and nervous signs it was considered that pigeons were suffering from ND [2, 15- 19]. Using the mentioned clinical criteria, the point prevalence of ND in pigeons was observed to be 10% in Faisalabad. Observations of our study are correlated with the findings of Shaheen *et al.* [16].

Respiratory signs were not observed in present study which is in conformity to the findings observed by Herdt and Devriese [20]. They did not observe any respiratory signs in field outbreaks or experimentally inoculated pigeons. Out of 40 ND infected pigeons, 29 pigeons were found seropositive (72%). The variation in antibody titer in clinically affected pigeons is a matter of great interest. This suggests a situation of persistence of NDV in pigeons due to non uniform protection. In a previous study, O.I.E [21] determined antibody titre against NDV in 105 wild and semi-domestic pigeons and found 42.86 % birds containing antibodies against ND. Belayheh [] documented 21.8% prevalence of ND in pheasant association through ELISA in area closely associated with the market. Gross lesions observed in the present study were pale liver, greenish material in gizzard, enlarged kidneys, splenomegaly and hemorrhages in brain and intestine. This is in congruence with Choi *et al.* [22]. However, Fuller *et al.* [23] reported the lack of gross lesions in natural ND outbreaks. The histopathological changes in kidneys seen in the present study (interstitial nephritis, atrophy of glomerulus, fibroblast proliferation and hypertrophy of proximal tubules) are in accordance with those reported by Wakamatsu *et al.* [24]. Excessive fibrosis in proventricular wall correlates with the findings of Mubarak and Rizvi [25]. Proliferation of fibroblasts, chronic inflammatory cell infiltration, degenerative changes and cellular swelling were the lesions found in liver which reinforce the findings reported by Kapczynski *et al.*[26]. We observed small misshapen villi and the lining columner epithelium of intestine in the infected birds. These findings are in line with the findings of [27, 25, 16, 28].

We applied HA and HI tests using hyper-immune sera against NDV. These are sensitive and specific diagnostic tests used for the detection and confirmation of NDV by various worker including Toro *et al.*, Zou *et al.* and Eman *et al.* [29, 33]. While conducting fecal examination only 3 birds were found positive for the intestinal parasites. Among them 1 was a roundworm and other 2 were the cestodes.

In conclusion, the present study indicated a 10 % prevalence of ND in pigeons in Faisalabad. Moreover, among ND infected pigeons, only 10.7 % pigeons exhibited co-infection with roundworms and cestodes.

Appropriate immunoprophylaxis, culling of NDV-infected birds and prudent anthelmintic therapy are recommended to circumvent the prevalence of ND and round worms in pigeons.

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