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## Preliminary Investigations on Occurrence of *Haemoproteus* spp. in Pigeons (*Columba livia*)

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### Abstract

Vector-borne hemoprotozoan infections are common in humans, animals and birds but they have been studied to a very limited extent in avian patients. Out of all birds, pigeons (*Columba livia domestica*) is the most common domiciliated bird which is seen around human habitats. This bird also holds reputation as common pet bird from a long period of time among bird enthusiasts. Pigeons suffer from a range of disease conditions; however, vector-borne diseases are not studied to a greater extent in Gujarat, India. Out of all vector-borne diseases, infection caused by *Haemoproteus* spp. has been more commonly reported in pigeon in different parts of the world. Distribution of this agent among hospital population of pigeons and other Columbiformes birds (e.g., doves) has not been explored in its entirety. Hence, the present preliminary investigation was carried out to observe the occurrence of *Haemoproteus* spp. in pigeons. The study included screening of medicinal and surgical cases of Columbiformes birds (N=59) to determine presence of subclinical and clinical infections. Results indicated that subclinical cases of *Haemoproteus* spp. were higher as compared to clinical infections and it can be detected in both types of cases, viz., medicinal and surgical cases with routine diagnostic modalities. The present paper elucidates the findings of the study.

**Keywords:** Pigeons, *Haemoproteus* spp., Occurrence

### Introduction

India is blessed with a wide range of mammals, reptiles and avian species. The domestication of such species has been practiced from a long period of time where animals such as cattle, buffalo, sheep, goat etc. are kept for milk and draft purposes; dogs and cats as pets/companions; birds such as pigeons, budgerigars, cockatiels etc. are kept as pets <sup>[1]</sup>.

Out of all birds, pigeons have been kept by many bird enthusiasts as pets. A wide variety of pigeons are available in pet markets which include some exotic varieties. On the other hand, there is a remarkable population of indigenous free-living pigeons which are often found in urban and rural areas <sup>[1]</sup>. Such pigeons often seek shelter in human localities because of drastic changes in natural habitats, deforestation and expansion of infrastructure. Moreover, factors such as vector population, climate change etc. also affects disease epidemiology and progression. Sick birds, due to their presence in human localities, are often seen by affectionate people who take them to nearby hospital for treatment while its close proximity to humans also renders them vulnerable to human-associated conflicts (e.g., kite string injuries, attacks by stray dogs, accidental injuries, damage by household hazards etc.). Therefore, pigeon is one of the most commonly reported birds with wide range of infectious and non-infectious conditions at veterinary hospitals <sup>[1]</sup>. This necessitates initiation of target-specific disease investigations.

Various infectious diseases such as pigeon pox, coccidiosis, endoparasitic infestations, ectoparasitic infestations, kite string injuries, paramyxovirus-1 infection, pseudomalaria etc. have been documented in pigeons <sup>[1, 2, 3, 4, 5]</sup>. Out of all, pseudomalaria is a common vector-borne disease which is caused by *Haemoproteus* spp. infecting the blood of pigeons and other Columbiformes birds. Pigeon fly, viz., *Pseudolynchia canariensis*, has been described to play

important role in transmission of this pathogen [5, 6]. So far, *Haemoproteus* spp. infection has not been studied thoroughly in hospital population of pigeons. Hence, an attempt was made to screen *Haemoproteus* spp. infection in 59 Columbiformes birds. The details of the study have been elaborated in the present paper.

### Materials & Methods

The present study was undertaken at Department of

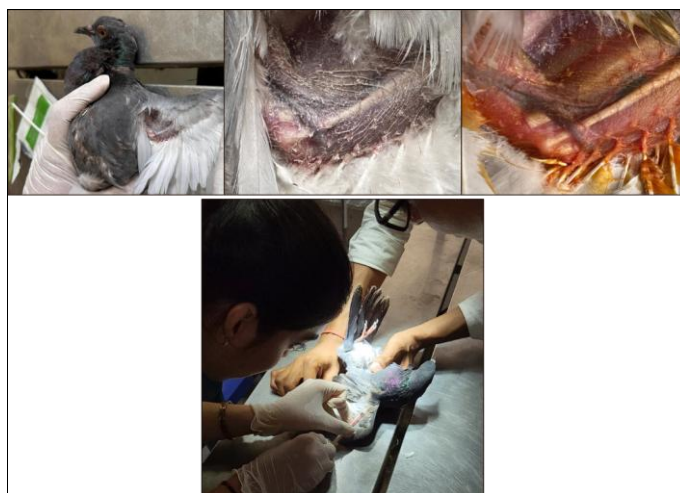
Veterinary Medicine, College of Veterinary Science & Animal Husbandry, Kamdhenu University (KU), Rajpur (Nava), Himmatnagar in collaboration with Veterinary Clinical Complex (VCC) between January to September-2024. A total of 59 birds belonging to Columbiformes order were screened which included 54 pigeons (pets and rescued birds) and 05 Diamond doves. Initially, birds were subjected to general physical examination [Picture-01].



**Picture 1:** Examination of a pigeon

Blood samples were collected from wing vein of pigeons suspected to have clinical signs suggestive of *Haemoproteus* spp. [Picture-02]. Moreover, the clinical signs of *Haemoproteus* spp. have been described to have some similarity with New Castle Disease Virus (NDV) infection. Therefore, the birds were subjected to differential diagnosis of

NDV infection using commercially available rapid diagnostic kits (BioNote, Korea) [Picture-03]. For surgical cases registered at VCC, the ongoing blood loss/hemorrhages were subjected to impression smear examination to detect presence of *Haemoproteus* spp. Blood samples were later subjected to staining by Field stain and Giemsa stain.



**Picture 2:** Preparation of site (wing vein) for blood collection

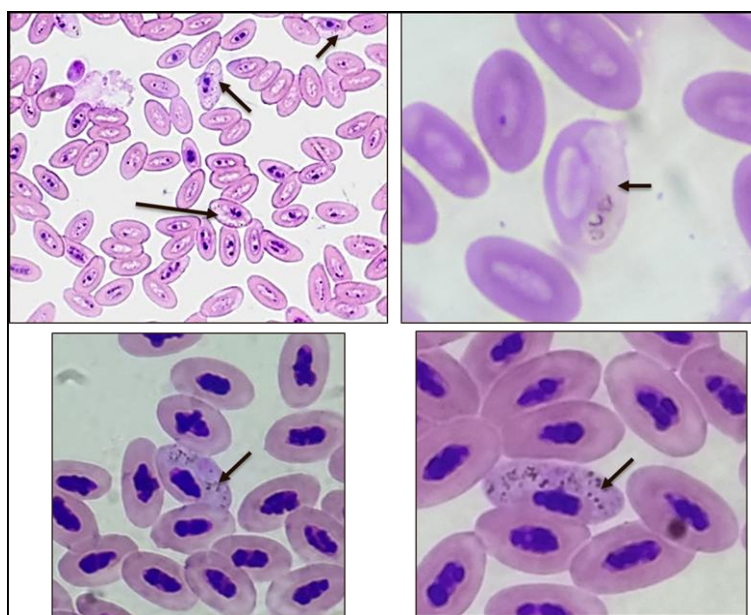


**Picture 3:** Performing Rapid Test for NDV in a pigeon and negative test result

## Result & Discussion

Overall, 59 Columbiformes birds (including 54 pigeons and 05 Diamond doves) were screened out of which, 19 showed presence of *Haemoproteus* spp. in blood smear [Picture-04]

with an overall presence of 32.20% (19/59). Among screened population of pigeons (n=54), this accounted to 35.19% (19/54) cases. *Haemoproteus* spp. was not detected in Diamond doves.



**Picture 4:** *Haemoproteus* spp. in blood smear of pigeons

These 54 cases of pigeons included 37 surgical and 17 medicinal cases/conditions. Subclinical *Haemoproteus* spp. infection (15 cases) were observed in 40.54% of all surgical cases of pigeons (15/37) while clinical infection of *Haemoproteus* spp. was seen in 23.53% of all medicinal cases of pigeons (04/17). The overall distribution of subclinical cases was thus higher (27.78%; 15/54) as compared to clinical

cases of *Haemoproteus* spp. infection in screened population of pigeons (07.41%; 04/54). Overall, presence of *Haemoproteus* spp. was more common as subclinical infection (78.95%; 15/19 positive samples) as compared to clinical infection (21.05%; 04/19 positive samples) [Table-01 & Figure-01].

**Table 1:** Distribution of cases positive for *Haemoproteus* spp. in different categories (54 pigeons)

| Analysis out of                 | Subclinical infection [15] | Clinical infection [04] |
|---------------------------------|----------------------------|-------------------------|
| No. of positive cases (19)      | 78.95                      | 21.05                   |
| Out of all surgical cases (37)  | 40.54                      | 00.00                   |
| Out of all medicinal cases (17) | 00.00                      | 23.53                   |
| Overall cases of pigeons (54)   | 27.78                      | 07.41                   |

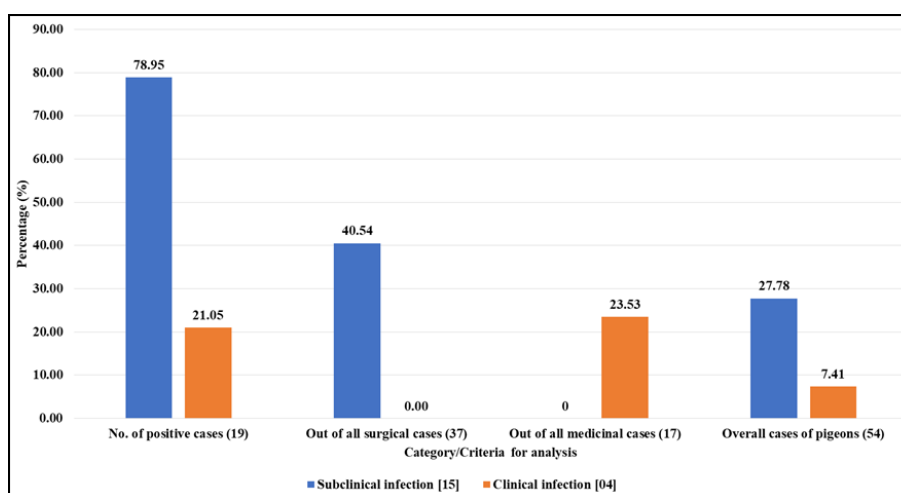


**Fig 1:** Distribution of cases positive for *Haemoproteus* spp. in different categories (54 pigeons)

In past, presence of *Haemoproteus* spp. in pigeons has been described in different parts of the world. All the clinical cases showed characteristic signs such as abnormal deviation of neck, ophthalmic discharge and abnormal droppings. The

deviation of neck or torticollis is also consistent with NDV which was the reason behind screening these birds for NDV using commercially available kits. None of the birds screened in the present study was found to have NDV infection.

Moreover, this could have been also due to variations in strains of NDV viruses; however, there was no evident outbreak (e.g., more number of birds with similar signs and symptoms at a time) during the period of study.

Generally, *Haemoproteus* spp. infection is termed as pseudomalaria or pigeon malaria which is transmitted by pigeon fly (*Pseudolynchia canariensis*). Role of slender pigeon louse (*Columbicola columbae*) is also suspected for transmission of the disease. Upon infection, this agent is observed to infect red blood cells of the pigeons forming a horse-shoe shaped structure around the nucleus. The protozoa can affect both, young and adult pigeons where stress factors (e.g., parasitic infestation, nutritional deficiencies, environmental stress etc.) contribute to development of clinical symptoms. The affected pigeons are often found to have weakness, dullness, ophthalmic discharge, abnormal neck deviation, reduced appetite, abnormal droppings, difficulty to fly, circling movements in some cases, inability to protect against predators and death in severe cases. The diagnosis of *Haemoproteus* spp. is comparatively easy in field condition and is often made by blood smear examination. Here, blood samples can be directly collected from wing veins of the bird while impression smears can be prepared from ongoing hemorrhages in case of injuries to screen the birds. Advanced diagnostic tests such as Polymerase Chain Reaction (PCR) has been used for molecular confirmation of species. Drugs such as chloroquine, primaquine and buparvaquone have been described for use as suitable treatment options with variable clinical outcome [5, 6, 7]. Diamond doves are smaller in size as compared to pigeons and are mostly kept as pets. It is observed that people keep more numbers of pigeons while Diamond doves are kept in lesser numbers. Additionally, more number of pigeons with access to open areas are prone to infestation by ectoparasites while Diamond doves are mostly kept indoors with proper hygienic measures. This could have been one of the reasons behind absence of infection in Diamond doves. However, it is advisable to screen larger population of Diamond doves and other birds belonging to Columbiformes order to ascertain actual abundance of *Haemoproteus* spp. in blood. The observations recorded in the present study has provided insights into noticeable presence of *Haemoproteus* spp. in pigeon which may be taken as baseline data to conduct further studies in a larger population of pigeons periodically in different geographic locations to understand disease epidemiology which would help to generate disease prevention strategies in future.

## Conclusion

The overall presence of *Haemoproteus* spp. was observed to be 35.19% among screened population of pigeons (n=54) where subclinical infection was higher (27.78%) as compared to clinical infection (07.41%). This baseline data indicates that presence of *Haemoproteus* spp. should be periodically checked in pigeons to ascertain current status of infection, disease progression and epidemiology in larger population.

## Conflict of Interest & Ethical Approval

Authors declare no conflicts of interest with regards to funding.

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### How to Cite This Article

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