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Study of ecto and haemo parasites in domestic pigeons *(Columba livia domestica)* in Sulaimani province, Kurdistan region/Iraq

Shadan Hassan Abdullah[1], Aram Ahmad Mohammed[1], Nahla Mohammed Saeid[1]

1 College of Veterinary Medicine / University of Sulaimani
E. mail: nahla.saeed@univsul.edu.iq

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Abstract

Pigeons are very well adapted and proliferate without control in urban centers. In this current study, ectoparasites and haemoparasites of 140 adult domestic pigeons *(Columba livia domestica*) of both sexes were studied, from different localities in Sulaimani province during April to October 2014, since there is no enough data regarding the frequency and identification of ectoparasites and haemoparasites in domestic pigeons in Sulaimani province. All pigeons were examined for the presence of ectoparasites and haemoparasites through checking of blood samples using Giemsa stain. As a result, various species of ectoparasites and haemoparasites were observed. From which, 4 species of lice were detected named *Columbicola columbae* (62.5%) followed by *Hoborstiella lata* (10.42%), *Campanulotes compar* (4.17%) and *Menacanthus stramineus* (3.13%). On the other hands, 19.79% of infected pigeons with ectoparasites were diagnosed with the presence of more than 1 lice species. Additionally, examined Giemsa stained smears showed that 55.72% of studied pigeons were harbor haemoparasites including *Haemoproteus* species (28.20%) followed by *Plasmodium* species (26.92%) and then *Leucocytozoon* species (11.53%) consequently.

Introduction

Pigeons have adapted to live in areas around the cities and they seem to be everywhere in urban environments [1]. Domestic pigeons *(Columba livia domestica)* are among precious domestic poultry species that are kept like other birds in the urban areas [2].

Ectoparasite infestations are considered as one of the more important parasitic diseases among both domestic and wild birds elsewhere. Generally, in poultry, ectoparasites can be seen on the skin or even penetrating the skin and air sacs or sometimes they spend their life under the feathers and during heavy infestations, they might be observed inside the feather quills [3]. Some of these ectoparasites consume skin dead cells and tissue fluids, while some of them suck blood.

Lice are considered as a dangerous and life threatening ectoparasite of poultry which caused illness, heavy morbidity, and irritation to the birds, which adversely affects the economical production of poultry farm (3). The intensity of ectoparasite infestation might decrease the power of bird's flight, especially in those pigeons that are used for racing. Lice can perforate the large wing- and tail-feathers which help them to increase heavy infestations, with considerable losing areas of the wing surface and lower flight efficiency [4].

Birds are infected by various numbers of intracellular blood parasites, including Haemosporidia that belonging to the genus *Plasmodium, Haemoproteus,* and *Leucocytozoon* [5]. Pigeons are usually in close contact with domestic fowls that leads to transferring of fowls host specific or host non-specific blood parasites directly to them. Thus, pigeons can be a reservoir and a good carrier of a number of parasitic infections that might transmit some of them to domestic fowls. The frequencies of *Plasmodium*, *Haemoproteus,* and *Leukocytozoon* are considerably high in domestic and wild birds, and *Haemoproteus columbae* considered as the most common blood parasites in pigeons [6].

Humans are easily infected by these parasites through inhaling the fecal dust from cages or from sites that have been contaminated with dry feces, urine, and other droppings, especially breeders, Veterinarians, industrial workers, and cleaning workers [7]. Therefore, the aim of this study is to determine the ectoparasites and haemoparasites of domestic pigeons to clarify their hazardous impact on human life.

Materials and Methods

This study was carried out on 140 adult domestic pigeons of both sexes, from different localities in Sulaimani province, Kurdistan region /Iraq during April to October 2014.

In recovering ectoparasites, the bodies of the birds were searched thoroughly and examined precisely by separating and opening of the wings with their feathers so as to expose the skin very well. Then, ectoparasites were collected, preserved in 70% ethanol [8] and identified under normal light and dissecting microscope according to the morphological characteristics using taxonomic keys [9].

Additionally, a drop of blood was collected directly from wing vein using sterile disposable 2 ml syringe, then put on the clean glass slide and thin blood smear was prepared for each bird. Later on, slides were immediately air dried, fixed in absolute methanol for 3 min, and then stained with Giemsa's stain. Finally, the entire blood smears were scanned and examined microscopically for the presence of blood parasites using high power field (HPF) [9].

Results

The present study showed that about 68.57% (96/140) of domestic pigeons were infested with different species of lice at various levels and mixed infestation with more than one species were also detected. Regarding the haemoparasitic infection, 55.72% (78/140) of examined pigeons were owned haemoparasites in their blood smears (Table 1).

Table 1. Frequency of ectoparasites and haemoparasites in domestic pigeons.

No. of pigeon examined	No .of infested pigeons with ectoparasites	Infestation rate (%)	No .of infected pigeons with haemoparasites	Infection rate (%)
140	96	68.57	78	55.72

Regarding ectoparasites reported from tested pigeons, about 80.21% (77/96) of cases were revealed single infection, while 19.79% (19/96) of the cases were showed mixed infection with more than one species. Instantly, isolated species were *Columbicola columbae* (62.5%) (60/96), followed by *Hoborstiella lata* (10.42%) (10/96), then *Campanulotes compar* (4.17%) (4/96), and finally *Menacanthus stramineus* (3.13%) (3/96) (Table 2, 3 & Figure 1).

Table 2. Frequency of ectoparasitic infestations in domestic pigeons.

Ectoparasites infestation	No. of infested	Infestation rate %
Single infestation	77	80.21
Mixed infestation	19	19.79
Total	96	100

Table 3. Frequency of lice species in domestic pigeons.

Lice species	No. of infested	Infestation rate %
Columbicola columbae	60	62.5
Hoborstiella lata	10	10.42
Campanulotes compar	4	4.17
Menacanthus stramineus	3	3.13
Total	77	80.21

Figure 1. Lice species (10X): **A.** *Campanulotes compar (female),* **B**. *Campanulotes compar (male),* **C.** *Hoborstiella lata,* **D.** *Menacanthus stramineus,* and **E.** *Columbicola columbae.*

Moreover, out of 140 examined pigeons, 55.72% (78/140) of them were harbor one or more species of haemoparasites in their blood (Table 4) in which *Haemoproteus* species was the most prevalence one about

28.20% (22/78) (Figure 2), followed by *Plasmodium* species 26.92% (21/78) (Figure 3), then *Leucocytozoon* species 11.53% (9/78) (Figure 4a and b).

Table 4. Frequency of Haemoparasites in domestic pigeons.

Haemoparasite species	Number of infected pigeons with haemoparasites	Percentage prevalence
Haemoproteus species	22	28.20
Plasmodium species	21	26.92
Leucocytozoon species	9	11.53
Plasmodium species & Leucocytozoon species	17	21.79
Plasmodium species & Haemoproteus species	4	5.12
Plasmodium ,Leucocytozoon species & Haemoproteus species	5	6.41
Total	78	100

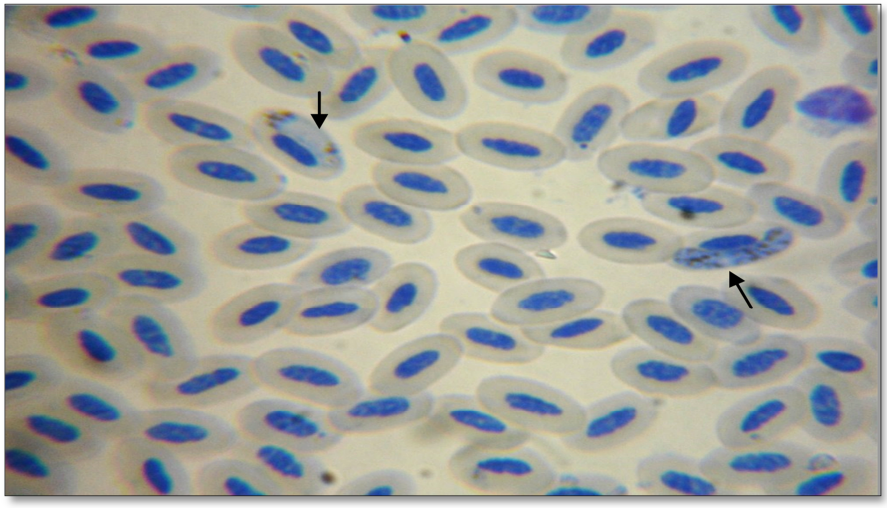

Figure 2. Blood smear of pigeosn infected by gametocytes of *Haemoproteus* species stained with Giemsa stain (100X).

Figure 3. Blood smear of pigeons infected by trophozoites of *Plasmodium* species stained with Giemsa stain (100X).

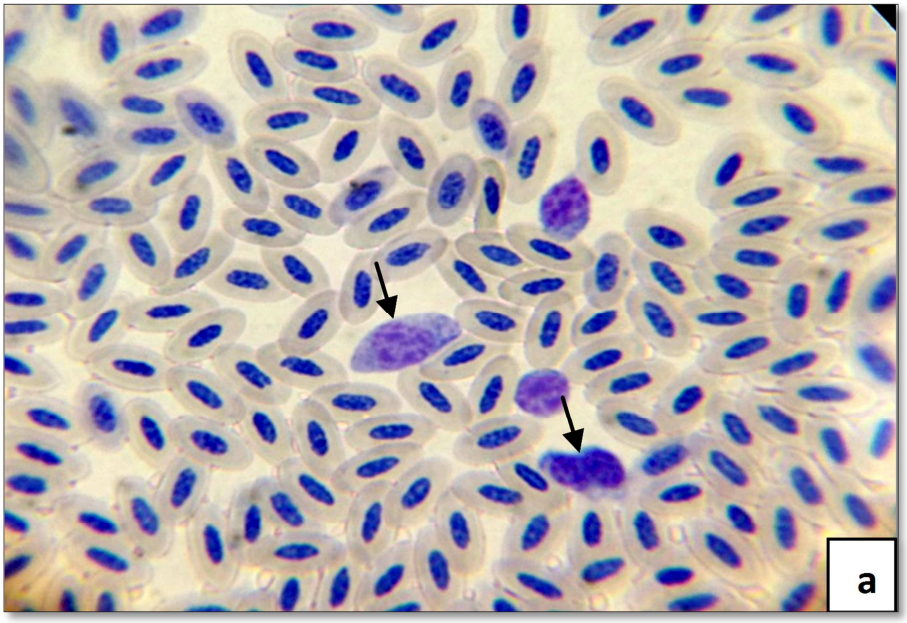

Figure 4a. Blood smear of pigeons infected by oval shaped gametocytes of *Leukocytozoon* species stained with Giemsa stain (100X).

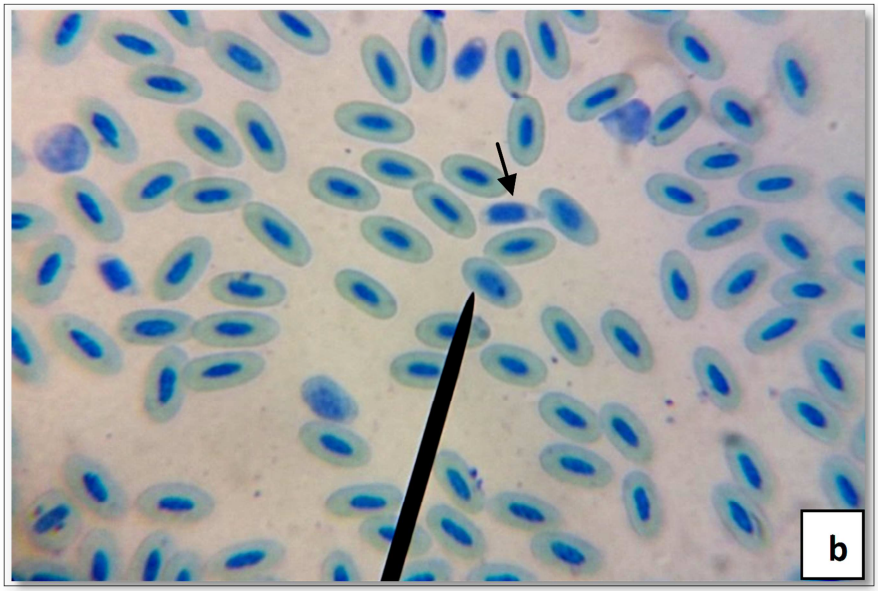

Figure 4b. Blood smear of pigeons infected by spindle shaped gametocytes of *Leukocytozoon* species stained with Giemsa stain (100X).

Discussion

The most common external parasites that pester our examined pigeons were lice, as we found in 96 examined birds with 68.57%, and among them, *Columbicola columbae* was the most prevalent species 62.5% (60/96).

Similar to our results, Dranzoa *et al.* [10] and Adang *et al.* [11] also reported a high prevalence of *Columbicola columbae* with 94.1% and 63.8% respectively. Also, Bahrami *et al.* [1] reported 30% of *C. columbae* species in their published research.

Mainly, amblyceran lice live on the skin of the affected birds and make them feel restless, unable to sleep, weakness, in appetite, loss of weight, decreased resistance to pathogens and diminish their reproductively

[12, 13]. On the other hands, feather lice chew up holes into the flights, make visible damage to the feathers [14], and irritate nerve endings that interfer with resting and sleep [15].

In this current study, *Menacanthus stramineus* was found in 3.13% of examined pigeons that is in agreement with Bahrami *et al.* outcomes [1]. Normally, lice feed on feather products, but *M. stramineus* consume large quantities of blood and hence it is regarded as the most destructive louse of birds worldwide [16]. Availability of more than 1 species of ectoparasites on the same host may be considered as low inter-specific competitive interaction that characterized by simultaneous infestations and may not be detrimental to the original available species [17].

This study, also determines the prevalence of haematozoa species that belongs to the genus *Haemoproteus, Plasmodium,* and *Leucocytozoon* in domestic pigeons. The overall prevalence of *Haemoproteus* was 28.2%. In Iran [2], it was found that *Heamoproteus* species was available in 24% of blood smears prepared from 100 healthy domestic pigeons, while Radfar *et al.* [18] reported higher prevalence of *Haemoproteus columbae* (43.2%) in Turkey. In Nigeria, Natala *et al.* [8] reported 76.5%, whereas in South Africa, 80% were reported [14]. In Colombia, 15.9% reported [19], whereas in USA, 22.8% were reported [20]. This species also available in Bangladesh [21] in 103 samples out of 110. Although this parasite is not associated with clinical disease and pathogenic disturbances [22], *H. columbae* may cause disease in stressed pigeons [23] which may be related to climatic condition and husbandry practices of pigeon.

About *Plasmodium* species, we reported 26.92% in the current study. Regarding mixed infection, Dranzoa *et al.* reported 29.4% mixed infection with *Haemoproteus* and *Plasmodium*, which is higher than the results obtained in this study (5.12%).

Furthermore, Londono *et al.* [24], reported that they found *Plasmodium* in 5.6% of tested pigeons, followed by *Haemoproteus* (2.6%) and *Leucocytozoon* (0.3%).

There is no clear correlation between the *Plasmodium* infection and the health of birds. It is observed that *Plasmodium* is not species specific [25, 26], pigeons could be a reservoir of *Plasmodium* species that also affect chickens and turkeys [10].

Arthropods are considered as the main hazardous vector for transmitting of Haematozoa infections to the vertebrate [5], such as *Plasmodium* that transferred by mosquitoes (Culicidae) and *Haemoproteus* that transferred by louse flies (Hippoboscidae) and biting midges (Ceratopogonidae) [27, 28]. The low prevalence of recorded *Plasmodium* species in our research may be due to low prevalence avian *Plasmodium* vector which is *Culex* mosquitoes in the area, in which they are not host specific and more active at night [10].

Leucocytozoon species is also reported in 11.53% of the examined blood samples of tested pigeons. Merlno *et al.* [29] reported that this species is the most prevalent parasites only in adult birds. On the other hands, 51.1% of *Leucocytozoon* species were reported among infected birds in South-East Queensland of Australia by Adlard *et al.* [30].

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