ECTO AND ENDO-PARASITES OF DOMESTIC PIGEONS (*COLUMBA LIVIA)* IN HAMEDAN, WEST PART OF IRAN

Zainab Sadeghi-Dehkordi*, Sakineh Azami*, Jamal Gharekhani, Mohammadreza Yousefi*** and Abbas Gerami-Sadeghian******

* Department of Pathobiology, Faculty of Veterinary Sciences, Bu-Ali Sina University, Hamedan, IRAN. E-mail: dehkordisZ@gmail.com
** Department of Laboratory Sciences, Central Veterinary Laboratory, Iranian Veterinary Organization, Hamedan, IRAN.
*** Department of Veterinary Parasitology, Islamic Azad University, Babol, IRAN.
**** Department Parasitology, Faculty of Veterinary Medicine, Tehran University, Tehran, IRAN.

[**Sadeghi-Dehkordi, Z., Azami, S., Gharekhani, J., Yousefi, M. & Gerami-Sadeghian, A.** 2019. Ecto- and endo-parasites of domestic pigeons (*Columba livia)* in Hamedan, west part of Iran. Munis Entomology & Zoology, 14 (2): 489-495]

ABSTRACT: The main aim of current survey was to determine the fauna and prevalence rate of ecto and endo-parasites in domestic pigeons (*Columba livia)* in Hamedan, west part of Iran. Eighteen pigeons evaluated for ecto and endo-parasites infestation between September and March 2016. The blood samples obtained from wing vein for diagnosis of haemoparasites using thin smears. The collected ectoparasites of body surface transferred to 70% ethanol for identification. At necropsy, each section of gastrointestinal and respiratory tracts of birds dissected, separately. Total isolated helminthes transferred to ethanol (70%) plus glycerin (5%) solution. Lungs, liver, kidneys and heart fixed in 10% formalin-buffer for histopathological examination. Among examined birds, 40/80 (50%) were infected with *Haemoproteus columbae*. The isolated helminthes were *Raillietina echinobothrida* (20%), *Ascaridia columbae* (25%), *Ascaridia galli* (36%) and *Hartertia gallinarum* (10%). In addition, three species of isolated ecto-parasites were *Pseudolynchia canariensis* (25%), *Columbicola columbae* (62.5%) and *Menopon gallinae* (30%). In pathological evaluation, Coli-Granoloma observed in liver of some cases. This is the first report on ecto and endo-parasites in domestic pigeons in Hamedan, West of Iran.

KEY WORDS: Pigeon, endoparasite, *Haemoproteus columbae*, ectoparasite

Pigeons and doves are distributed everywhere on Earth. Pigeons have domesticated for hundreds of years and their relationship with human is very old. Pigeons used for a long time as a food resource, pets or cultural and religious symbols. In addition, they make good laboratory animals, as in the diagnosis of fowl cholera (Cooper, 1984). They can carry some of pathogens and/or diseases to other birds such as coccidiosis, cryptococcosis, newcastle and histoplasmosis (Rehman, 1993; Opara et al., 2012) and play important role in transmission of zoonotic pathogens for human (Vucemilo et al., 2000; Karatepe et al., 2010). There are many pathogens related to hygiene and management of pigeons such as ecto and/or endo-parasites.

Different of parasite species can be infect pigeons and caused reduce of performance and increase of mortality (Rupiper, 1998; Dranzoa et al., 1999; Eckert, 2000). In Iranian pigeons, the fauna and rate of parasitic infection was reported in limit scale (Ashrafihelan et al., 2010; Radfar et al., 2012; Dik & Halajian, 2013; Khezerpour & Naem, 2013). Many studies have been recorded on birds' haemoparasites worldwide (Bensch et al., 2004; Hellgren et al., 2004; Ricklefs et al., 2005). In the different species of haemoparasites, *Haemoproteus* and *Leucocytozoon* are common and harmful for pigeons (Bernett & Perice, 1989;

Atkinson et al., 2000). Recently, few studies were done on *Haemoproteus columbae* infection rate in pigeons from Iran such as Youssefi et al. (2010) in northern Iran, Razmi & Andalibian (2006) in Mashhad (northeastern Iran), Nematollahi et al. (2012) in Isfahan (Central of Iran) and Dehghani-Samani et al. (2013) in southwestern Iran.

There was no report parasitic infection on pigeons in western Iran. Therefore, the current survey was aimed to evaluate of ecto and endo-parasite fauna and infection rate in pigeons from Hamedan, for the first time.

MATERIALS AND METHODS

This study was done on 80 pigeons from September to March 2016 in Hamedan located, west part of Iran. The caught birds were transferred to the parasitology laboratory of Veterinary Sciences School, Bu-Ali Sina University, Hamedan. All of blood smears stained with Giemsa for haemoparasites identification using light microscopy. The isolated ecto-parasites transferred to ethanol (70%) plus glycerin (5%) solution for preservation and identification (Graciolli & Carvalho, 2003). For detection of helminthic parasites, total sections of gastrointestinal and respiratory tracts dissected and inspected, separately. The isolated nematodes were placed in AFA solution (alcohol, formaldehyde, acetic acid, distilled water, and glycerin), and all of them cleared with lacto phenol (25% glycerin, 25% lactic acid, 25% phenol and 25% distilled water). Cestodes removed from small intestine stained with acidified alum/carmine and identified using diagnostic keys (Soulsby, 1986; Fowler, 1990).In all of cases, lungs, liver, kidneys and heart fixed in 10% buffered neutral formalin for histopathological examinations. The tissue samples processed embedded in paraffin wax, sectioned and stained with hematoxylin and eosin (Sol et al., 2003).

Statistical analysis performed with SPSS 18.0.0 (SPSS Incorporation) and Chi Square tests methods.

We hereby declare all ethical standards have been respected in preparation of the submitted article. All of protocols reviewed and approved by the research council of Bu-Ali Sina University, Hamedan, Iran.

RESULTS

Out of 80 pigeons (36 males and 44 female), 34 (42.5%) harbored one or more species of helminthes, 32 (40%) had one or more ecto-parasites and 40 (50%) were infected with haemoparasites (Table 1). All of infected birds had symptoms such as cachexia, diarrhea, and dehydration. The prevalence of isolated endo-parasites demonstrated in Table 2. One species of cestodes (Raillietinae: *Raillietina echinobothrida* (20%)) and three species of nematodes (Ascaridae: *Ascaridia colombae* (25%), *Ascaridia galli* (36%) and Spiruridae: *Hartertia gallinarum* (10%)) were detected (Figs. 1 and 2). Three species of ecto-parasites were *Pseudolynchia canariensis* (25%), *Columbicola columbae* (62.5%) and *Menopon gallinae* (30%) (Table 3).

The infection rate of *Haemoproteus columbae* was 50%. The parasitemia sourced by *H. columbae* was identified ≤1% in five, 1-3% in eight and ≥%3 in seven pigeons. Of the 40 positive blood smears, in 70% (28/40) 1-2 erythrocytes and in 30% (12/40) more than three erythrocytes were observed to be infected with gametocytes of *H. columbae*.

In pathological evaluation, Coli-Granuloma observed in liver of some cases. In addition, the lesions similar to tuberculous tissue were detected in the liver. In histopathology of lesions, necrotic tissues were observed surrounded by epitheloid and giant cells (Fig. 4).

DISCUSSION

In current investigation, 24/80 (30%) of pigeons were infected with helminthes; this result is considered modestly with previous surveys in Iran and other countries. In our study, *A. galli* and *H. gallinarum* were the highest and lowest of infections, respectively; parallel to Ashrafihelan et al. (2010) study in Tabriz, North-west of Iran. According to our finding, *H. gallinarum* was isolated in Iranian domestic pigeons for first time. In past study from southern Iran, *H. gallinarum* infection was reported on fowl (Eslami & Mozafarinejad,1993). Because of macroscopic similarities between the morphology of *H. gallinarum* and *A. galli*, it is much probable that poultry practitioners take one of these two species for the other. Life cycle, pathogenicity and treatment protocol can help to miss diagnosis of this two species. In our study, the prevalence of *H. gallinarum* was significantly lower than other endo-parasites ($p<0.05$). Borghare et al. (2009) displayed heavy infection with *Capillaria* spp., *Ascaridia* spp. and *Hetarakis* spp. in wild pigeons from Maharajbagh Zoo, Nagpur.

In a similar study from South of Iran, the infection rate with *R. echinobothrida*, *R. tetragona*, and *A. columbae* was reported 70%, 9% and 1%, respectively (Shayeste, 1996). *R. echinobothrida* was the most common of cestodes, which is in agreement with our finding (Naem & Eskandari, 2005; Nabavi et al., 2005; Khezerpour & Naem, 2013). *R. echinobothrida* is an important of cestodes in pigeons; but it will be interesting to study the reasons that pigeons are more susceptible to *R. echinobothrida* compared to other birds. Further investigations of health factors, blood parameters and growth rate may be indicating the role of helminthic infection in pigeons.

In this study, mixed helminthic infections were less than single infections. Our findings indicate that pigeons could be less susceptible to mixed infections compared to chickens. The changes of climate and temperature are very effective on the health and growth of birds (Msoffe et al., 2010). *Syngamus trachea* were found in pigeons in Ilam province, Southwestern Iran (Bahrami et al., 2012); which is in contrast to present study and other surveys (Radfar et al., 2011; Al-Barwari & Saeed, 2012; Musa et al., 2011; Msoffe et al., 2010; Senlik et al., 2005; Adang et al., 2009; Natal et al., 2009; Ashrafihelan et al., 2010).

Serve infection of *R. echinobothrida*, *C. columbae* and *Tetrameres* spp. was reported in gees population from Gilan province, North of Iran (Hosseini et al., 2001). In Eslami et al. (2009) study in Golestan, northern Iran, 96% of fowl harbored at least one species of parasite. According to past investigations from Iran, parasitic infections in pigeons are lower than other birds (Hoseini et al., 2001; Eslami et al., 2009). It is due to the type of host dietary habitat and immune mechanism.

Among of ecto-parasite infestation, *C. columbae* had the highest prevalence (62.5%), followed by *P. canariensis* (25%) and *M. gallinae* (20%). According to Harlin (1994), *C. columbae* is the most common mallophaga parasites in pigeons. The infestation rate of *C. columbae* is agree with other hands, but the infestation rate of *M. gallinae* was significantly lower than *C. columbae* and *P. canariensis* ($p=0.02$).

In the present study, 50% of birds were infected with *H. columbae*. *H. columbae* is the most common of heamo-protozoan parasite that transmitted by biting of Hippoboscidae (Marques et al., 2007). In addition, infestation rate of *P.*

canariensis were 25%, which is suitable biological vector of *H. columbae*. There was a noticeable relationship between the prevalence of *H. columbae* and *P. canariensis*. In similar previous surveys, infection rate of *H. columbae* was reported 17.5%, 33% and 57% in pigeons from northern, northeastern (Mashhad), and Central (Isfahan) of Iran, respectively (Razmi & Andalibian, 2006; Youssefi et al., 2010; Nematollahi et al., 2012). The prevalence of *Haemoproteus* spp. in free-living pigeons in urban regions of Santa Catarina, Brazil was detected 62.2% and 46.5% using Quick Panoptic and Giemsa methods, respectively (Marques, 2007), which are in accordance with our findings. Geographical location and climatic conditions, difference in feeding habitat and abundance of vehicles are the most reason of difference prevalence rate of *Haemoproteus*.

The differences of helminthic infections within the months are due to the availability and distribution of their intermediate hosts (Olsen & Braun, 1980). Pigeons have ability to transmit pathogenic agents to both human and birds. *Toxoplasma gondii*, an important protozoan zoonotic disease, has detected in pigeons from some regions of the world (Karatepe et al., 2011). Moreover, various bacterial and viral infections such as *Salmonella, Campylobacter* and *Paramyxovirus* can be transfer from birds to human (Vucemilo et al., 2003). According to important role of pigeons as a risk factor for human and poultry health, design the comprehensive studies are need to investigate the parasitic infection of pigeons in different regions of Iran. Neither of the referenced studies revealed the presence of ecto and/or endo-parasites that could be zoonotic to human, nor did the present study. In our work, there was no statistical significant difference between ecto and endo-parasite infestations (p=0.39).

In conclusion, this is the first report on ecto and endo-parasites in domestic pigeons in Hamedan, west part of Iran.

ACKNOWLEDGMENTS

Authors are thankful to Mr. Younes Rostami, Danial Yusefnia and Ebrahim Kargar for help in sampling.

CONFLICT OF INTEREST STATEMENT

We declare that there is no conflict of interests.

LITERATURE CITED

Adang, K. L., Oniye, S. J., Ezealor, A. U., Abdu, P. A., Ajanusi, O. J. & Yoriyo, K. P. 2009. Ectoparasites and intestinal helminths of speckled pigeon (*Columba guinea*) (Hartlaub and Finsch 1870) in Zaria, Nigeria. Science World Journal, 4: 1-5.

Al-Barwari, S. & Saeed, L. 2012. The parasitic communities of the Rock pigeon (*Columba livia*) from Iraq: Component and importance. Turkiye Parazitology Dergisi, 36: 232-239.

Ashrafihelan, G., Norozi, R., Seyed-Hosein, N. & Mehpeika, R. H. 2010. An identification of helminth parasites and gastrointestinal infection domestic pigeon in Tabriz, Iran. Iranian Journal of Veterinary Research, 6 (3): 52-57.

Atkinson, C. T., Dusek, R. J., Woods, K. L. & Iko, W. M. 2000. Pathogenecity of avian malaria in experimentally infected Hawiian anakids. Journal of Wild Disease, 36: 197-204.

Bahrami, A., Nasrolahi, O. A., Ahmady, S., Doosti, A., Bahrami, A. & Monfared, A. L. 2012. Survey of egg per gram (EPG) parasite ovum in pigeon. International Journal of Molecular and Clinical Microbiology, 1: 103-105.

Bensch, S. J., Pe´rez-Tris, J., Waldenstro, M. & Hellgren, O. 2004. Linkage between nuclear and mitochondrial DNA sequences in avian malaria parasites: Multiple cases of cryptic speciation. Evolution, 58: 1617-1621.

Bernett, G. F. & Perice, M. A. 1989. The haemoproteids of the avian family Phasianidae. Canadian Journal of Zoology, 67: 1557-1565.

Borghare, A. T., Bagde, V. P., Jaulkar, A. D., Katre, D. D., Jumde, P. D., Maske, D. K. & Bhangale, G. N. 2009. Incidence of gastrointestinal parasitism of captive wild pigeons at Nagpur. Veterinary World, 2: 343.

Cooper, J. E. 1984. A veterinary approach to pigeons. Journal of Small Animal Practice, 24: 505-516.

Dehghani-Samani, A., Pirali-Kheirabadi, K. H., Dehghani Samani, A. B. 2013. Prevalence and Rate of Parasitemia of *Haemoproteus columbae* in *Columba livia domestica* in Southwest of Iran. Iranian Journal of Parasitology, 8: 641-644.

Dranzoa, C., Ocardo, M. & Katete, P. 1999. The ecto-, gastrointestinal and haemo-parasites of live pigeons (*Columba livia*) in Kampala, Uganda. Avian Pathology Journal, 28: 119-124.

Eckert, J. 2000. Helminthosen des NutzgeflüUgels. In: Rommel M., Eckert J., Kutzer E., KöUrting W., editors. Schnieder, Vetetinary Urmed Parasitology. Parey Buchverlag, Berlin.

Eslami, A., Ghaemi, P. & Rahbari, S. 2009. Parasitic infections of free-range chickens from Golestan Province, Iran. Iranian Journal Parasitology, 4: 10-14.

Eslami, A. & Mozaffarinejad, H. 1993. The occurance of *Hartertia gallinarum* in the indigeous chicken of southern part of Iran. Journal of Veterinary Research, 47: 123-124.

Fowler, N. G. 1990. How to carry out a field investigation In: Poultry Disease, F,T.W. (Ed.) Bailliere Tindall, London; 370-400.

Graciolli, G. & Carvalhoc, J. B. 2003. Hippoboscidae (Diptera, Hippoboscoidea) no Estado do Paraná, Brasil:chaves de identificação, hospedeirose distribuição geográfica. Revista Brasilian Zoology Journal, 20: 667-674.

Harlin, R. W. 1994. Pigeons. The veterinary clinics of North America. Small Animals Practice, 24: 157-173.

Hellgren, O., Waldenstro, M. J. & Bensch, S. 2004. A new PCR assay for simultaneous studies of *Leucocytozoon*, *Plasmodium*, and *Haemoproteus* from avian blood. Journal Parasitology, 90: 797-802.

Hosseini, S. H., Saifuri, P., Eslami, A. & Nabieian, S. 2001. Parasitic infections of gray leg goose (Anseranser) in Gilan province, Iran. Journal of Faculty Veterinary Medicine University Iran, 56: 56-60.

Karatepe, M., Kılıc, S., Karatepe, B. & Babur, C. 2011. Prevalence of *Toxoplasma gondii* antibodies in domestic (*Columba livia domestic*) and wild (*Columba livia livia*) pigeons in Niğde region, Turkey. Turkiye Parazitology Dergisi, 35: 23-26.

Khezerpour, A. & Naem, S. 2013. Investigation on parasitic helminthes of gastrointestinal, liver and lung of domestic pigeons (*Columba livia*) in Urmia, Iran. International Journal Livestock Research, 3: 35-41.

Marques, S. M. T., Quadros, R. M., Silva, C. J. & Baldo, M. 2007. Parasites of pigeons in urban area of larges Southern Brazil. Parasitology Journal, 62: 183-187.

Msoffe, P. L., Muhairwa, A. P., Chiwanga, G. H. & Kassuku, A. A. 2010. A study of ecto-and endo-parasites of domestic pigeons in Morogoro municipality,Tanzania. African Journal of Agriculture Research, 3: 264-267.

Musa, S., Dil-Afroz, S. & Khanum, H. 2011. Occurence of ecto-and endo parasites in pigeon (*Columba livia*) Linn University. Journal of Zoology, 30: 73-75.

Nabavi, R., Manouchehre-Naiini, K., Yavari, M. & Zebardast, M. 2005. Study on the gastrointestinal helminthes of native fowls of Shahreh-Kord. Iranian Journal of Veterinary Science, 2: 311-316.

Naem, S. & Eskandari, S. 2005. Prevalence of intestinal helminths of native chickens 13 in Urmia, Iran. Iranian Journal of Veterinary Research, 3: 200-203.

Natal, A. J., Asemadahun, N. D., Okobanjo, O. O. & Ulyi, B. M. 2009. A survey on prasaites of domestic pigeons (*Columba livia domestica*) in Zaria, Najeria. International Journal Soft Comp, 4: 148-150.

Nematollahi, A., Ebrahimi, M. & Mohammadpour, H. 2012. Prevalence of *Haemoproteus columbae* and *Trichomonas gallinae* in pigeons (*Columba domestica*) in Isfahan, Iran. Journal Parasitic Disease, 38: 141-142.

Olsen, O. W. & Braun, C. E. 1980. Helminths parasite of band tailed pigeons in Colorado. Journal of Wildlife Disease, 16: 65-66.

Opara, M. N., Ogbuewu, I. P., Iwuji, C. T., Njokua, L., Ihesie, E. K. & Etuka, I. F. 2012. Blood characteristics, microbial and gastrointestinal parasites of street pigeons in Owerri Imo State, Nigeria. Journal of Animal Science, 1: 14-21.

Radfar, M. H., Fathi, S., Asl, E. N., Dehaghi, M. M. & Seghinsara, H. R. 2011. A Survery of parasites of domestic pigeon (*Columba livia domestica*) in South Khorasan, Iran. Iranian Journal of Veterinary Research, 4: 18-23.

Radfar, M. H., Norouzi-Asl, E., Rezaei-Seghinsara, H., Mirzaei-Dehaghi, M. & Fathi, S. 2012. Biodiversity and prevalence of parasites domestic pigeons (*Columba livia domestica)* in a selected semiarid zone of South Khorasan, Iran. Tropical Animal Health Journal, 44: 225-229.

Razmi, G. & Andalibian, E. 2006. Survey on infestation to *Haemoproteus columbae* in pigeons of Mashhad. Paghoohesh and Sazandeghi, 71: 95-96.

Rehman. 1993. A study on the prevalence of *Ascaridia galliane* the effects of experimental infection on various blood parameters and body weight in the chicken. MSc. Thesis, Univ of Agric. (CVS), Faisalabad-Pakistan.

Ricklefs, R. E., Swanson, B. L., Fallon, S. M., Abrain, A. M., Scheuerlein, A., Gray, J. & Latta, S. C. 2011. Community relationships of avian malaria parasites in southern Missouri. Ecology of Mono Journal, 75: 543-559.

Rupiper, D. J. 1998. Diseases that affect race performance of homing pigeons. Part II: Bacterial, fungal and parasitic diseases. Journal of Avian Medicine and Surgery, 12: 81-86.

Senlik, B. & Gulegen-EandAkyol, V. 2005. Effect of age, sex and season on the prevalence and intensity of helminth infections in domestic pigeons (*Columba livia*) from Bursa province, Turkey. Acta Veterinary Hungarica Journal, 53: 449-456.

Shayeste, H. 1996. An investigation on parasitic helminthes of gastrointestinal domestic pigeons in Ahvaz. DVM thesis Veterinary, University of Shahid Chamran of Ahvaz, 235: 66-68.

Sol, D., Jovni, R. & Torres, J. 2003. Parasitemediated Mortality and Host Immune Response Explain Age- related Differences in Blood Parasitism in Birds. Oncologia Journal, 135: 542-547.

Soulsby, E. J. L. 1986. Helminths, arthropods and protozoa of domesticated animals. 7th Edition, London.

Vucemilo, M., Vlahovic, K., Dovc, A., Muzinic, J., Pavlak, M., Jercic, J. & Zupancic, Z. 2003. Prevalence of *Campylobacter jejuni, Salmonella typhimurium*, and avian Paramyxovirustype 1 (PMV-1) in pigeons from different regions in Croatia. Zeitschrift Fur Jagdwissenschaft, 49: 303-313.

Youssefi, M. R., Sadeghian, A. G. & Esfandiari, B. 2010. Prevalence of *Haemoproteus columbae* infection in *Columba livia* in North of Iran. World Journal of Zoology, 5: 275-277.

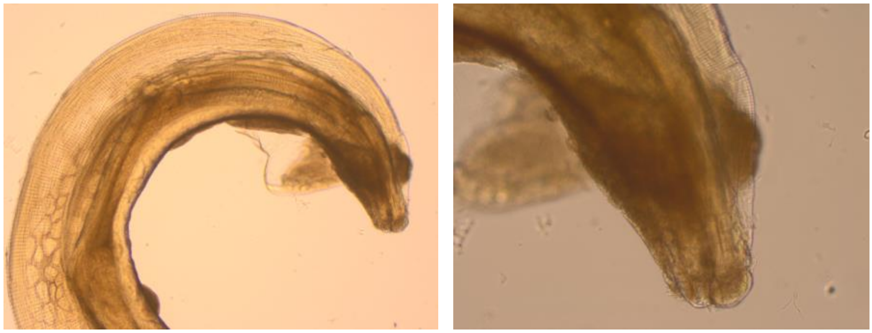

Figure 1. *Hartertia gallinarum* (male): anterior end.

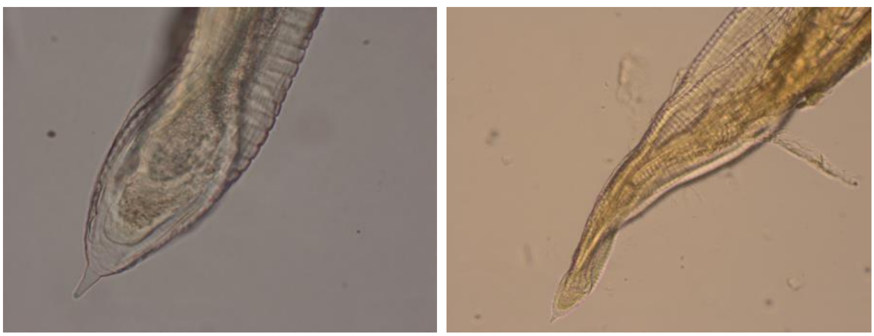

Figure 2. *Hartertia gallinarum* (male): posterior end.

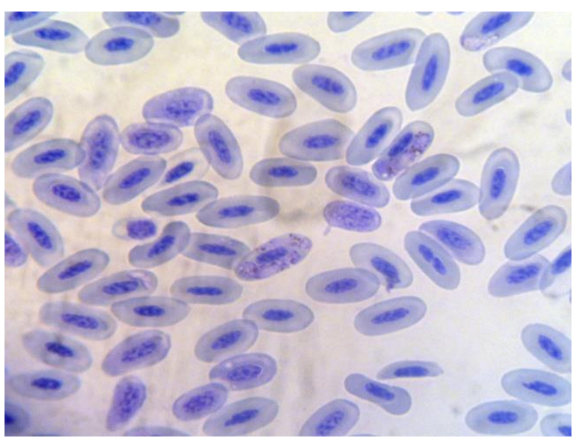

Figure 3. Macro and Microgametocytes of *Haemoproteus columbae* within RBC of pigeon, stained with Giemsa.

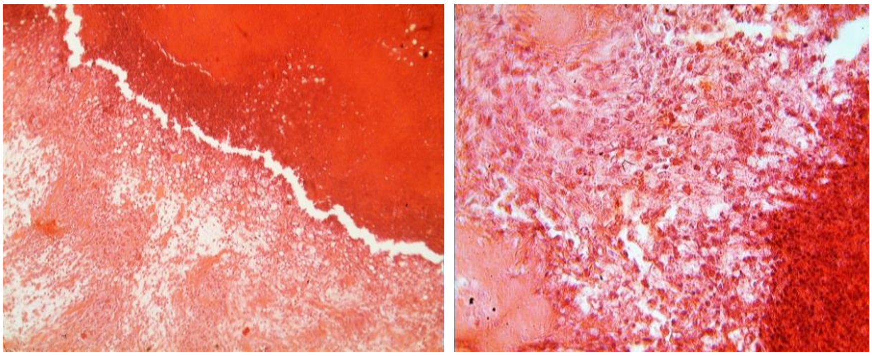

Figure 4. Haemosidrin pigment and hyperplagia of bile duct also diffuse necrosis in hepatocyte.

Table 1. The frequency of mixed infection (n=24) in examined pigeons (n=80) in Hamedan.

Mixed infection	Prevalence (%)
Ascaridia colombae + *Ascaridia galli*	6 (7.5)
Ascaridia galli + *Hartertia gallinarum*	4 (5)
Ascaridia galli + *Raillietina echinobothrida*	4 (5)
Menopon gallinae + *Columbicola columbae*	10 (12.5)

Table 2. Endoparasites recovered pigeons (n=80) in Hamedan.

Parasite spp.	No. of infection (%)	Infection range (Min-Max)
Raillietina echinobothrida	4 (5)	1-5
Ascaridia galli	8 (10)	1-11
Ascaridia columbae	5 (6.25)	1-7
Hartertia gallinarum	1 (1.25)	1-2
Haemoproteus colombae	40 (50)	3-10

Table 3. Ectoparasites recovered from pigeons (n=80) in Hamedan.

Parasite spp.	No. of infection (%)	Infection range (Min-Max)
Menopon gallinae	8 (10)	1-3
Columbicola columbae	25 (31.25)	1-12
Pseudolynchia canariensis	20 (25)	1-3