A Survey of Parasites of Domestic Pigeons  
(*Columba livia domestica*) in South Khorasan, Iran

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**Abstract:** The aim of this study was to determine the prevalence, intensity and species of internal and external parasites in pigeons in Birjand, South Khorasan from October 2008 to September 2009. The samples were taken from 102 pigeons (44 nestlings and 58 adults). Total 5 species of nematodes and cestodes were collected from alimentary canals. *Ascaridia columbae* (16.66%), *Hadjela truncata* (1.96%), *Catena digonopora* (13.79%), *Raillietina magnimunida* (18.62%), *Raillietina achinobothridia* (32.35%). Faecal samples were collected and examined through the centrifugal flotation method using Sheather’s saturated sugar solution for diagnosis of *Eimeria* sp. *Eimeria* sp. identified in 40.19% of pigeons. Cryptosporidium oocysts were identified in 2.94%. About 2 blood smears taken from each bird were stained with Gimsa. Gimsa methods detected 47.05% of Haemoproteus clonumbe. The infestation rate with *Trichomonas gallinae* was 57.84%. Total 4 species of ectoparasites were collected from feathers and subcutaneous nodules as follows: feathers: *Pseudolynchia canariensis* (63.72%), *Columbicola columbae* (79.41%), *Menopen galline* (44.11%). subcutaneous nodules: *Laminosiopistes cysticola* (1.96%). From the parasitic fauna seen in this study, it is imperative to institute an integrated parasitic control through constant changing of litter, regular use of anthelmintics, anticoccidials and dusting of birds with pesticides.

**Key words:** Domestic pigeons, parasites, subcutaneous, pesticides, South Khorasan, Iran

**INTRODUCTION**

Pigeons are seen in more region of the world except for the poles. Pigeons live side by side with humans and other animal species in the nature and they are bred as a source of food as a hobby, symbol and for experimental aims (Cooper, 1984, Harlin, 1994). It’s interaction with man and other domestic and wild birds, portends it as a potential carrier of zoonotic parasites (Adang et al., 2008). They have a role in spreading some zoonoses to people as well as being a reservoir of many parasitic diseases for poultry (Kamirjolo et al., 1988; Piasecki, 2006). Various parasites significantly impede pigeon growth, development and productivity, it at times result to death, especially, the sqab.

Such sick birds are often slaughtered pre-maturely by the breeders instead of seeking for their cure. However, little is known about the socio-economic importance, management and health aspects of these birds. Due to perceived little importance of pigeons, little attention in terms of research has been directed towards the species in Iran. Information on the parasite infection of domesticated pigeons in different region of Iran appears to be poorly documented (Derakhshianfar et al., 2004; Yousefi et al., 2010; Moghaddas et al., 2010; Pirali-Kheirabadi et al., 2008).

The current study was therefore, designed to provide holistic information on parasites of domestic pigeons with the hope of designing an integrated parasite control for these birds. The aim of this study was to determine, the prevalence, intensity and species of internal and external parasites in domestic pigeon in Birjand area in South Khorasan of Iran and to obtain information about the effects of some factors such as maturity on parasitic infections.

**MATERIALS AND METHODS**

**Study area:** Study was carried out in Birjand, capital South of Khorasan province in the east of Iran during
October 2008 to September 2009. The samples were taken from 102 pigeons (44 nestlings and 58 adults). From Birjand. This city (South Khorasan) is geographically located at latitude (32.88 degrees) 32° 52' 48" North of the Equator and longitude (59.22 degrees) 59° 13' 11" East of the Prime Meridian on the map of the world.

Investigation of the parasites
Antemortem examination: The blood samples were collected using an insulin syringe inserted through a brachial vein catheter. Each sample provided blood smeared, fixed with methanol and stained with Giemsa dyes. The slides were analyzed under light microscopy using an oil immersion objective. For diagnosis of trichomonans gallinaceus, wet and sterile swab taken from surface of mouth, throat and larynx of pigeons and after preparation slide smears, the samples were studied under the light microscope. All parasites were identified using the parasitological keys (Soulsby, 1982).

Postmortem examination: The ectoparasites were collected as described by Soulsby (1982), briefly after killing the pigeons by anaesthesia, they were immediately placed in a polythene bag and the parasites collected after leaving the pigeons. The ectoparasites were preserved for identification purposes in 70% alcohol. Subcutaneous nodules of each bird were fixed in 10% potassium, heated for 20 min in a jar containing water and their sediments were searched for parasites. Routine examinations were made of the entire alimentary tract, respiratory system, liver, heart, kidney and reproductive tract as follows. The nematodes and cestodes removed and washed by water and a number of nematodes were cleared in lactophenol for identification and the rest of them stored in 70% alcohol containing 5% glycerin for parasitological examination. Cestodes were fixed in 10% formalin and stained with rhodamine acid for further studies.

The worms were identified under light microscope according to the helminthological keys Soulsby (1982). After three washes of the faecal samples, the sediment from each sample was mixed with Sheeper's saturated sugar solution, centrifuged and then examined under a microscope for the presence of protozoa oocysts (Eimeria oocysts). Detection of cryptosporidium oocysts was performed using the formalin-ether sedimentation method and the modified Ziehl-Neelsen staining technique and then examined under a microscope for the presence of protozoan oocysts.

Statistical analysis: The computer software, SPSS Version 9.0 for Windows (SPSS Inc., Chicago, IL, USA) was used for analysis. To compare relative frequency of infection between adult and nestling of pigeons $\chi^2$-tests was used. Differences were considered significant when $p<0.05$.

RESULTS AND DISCUSSION
Parasite species: The prevalence of parasite species identified in nestlings and adults pigeons is shown in Table 1-3. Out of a total of 102 pigeons (44 nestlings and 58 adults pigeons) examined, 43 (42.15%) were infected with one or more species of helminthes also 17 (16.66%) of the pigeons were infected by nematodes and 26 pigeons (25.49%) were infected with the cestodes. Pigeons were infected with one or more helminth. About 91.17% (93/102) pigeons were infected with one or more etoparasites. Giemsa methods detected 47.05% (48/102) of Haemoproteus columbae, Eimeria sp. was identified in 40.19% (41.102). Cryptosporidium oocysts were identified in 2.94% (3.102) of the samples.

A total of 5 different worms species were identified in alimentary tract, 4 different ectoparasites and 4 protozoan species. In total 3 species of cestodes belonging to family, Davaineidae and 1 species of nematode belonging to family Heterakidae was found in both nestlings and adults and 1 species of nematode belonging to family Hederidae was found in adults pigeons. No trematodes were found in the study. The 4 different species of ectoparasites identified were Pseudolynchia canariensis (pigeon fly), Columbicola columbae, Menopena gallinae found in both nestlings and adults while Laminosioptes cysticola was found in adult only. This bird, however did not show any lesions either in breast or in neck muscles. The protozoan species identified was found in both nestlings and adult pigeons (Table 3).

The analysis showed that worms were significantly ($p<0.05$) more prevalent in adults than in the nestlings. T. gallinae and Eimeria sp. were significantly ($p<0.05$) higher in nestlings pigeons than in adults while the H. columbae and P. canariensis were significantly ($p<0.05$) higher in adult pigeons than in nestlings.

Also infection rate of Cryptosporidium sp. was not significantly ($p>0.05$) in adult pigeons than in nestlings.

In Iran, a limited number of studies have been performed in relation to parasite infections in pigeons (Derakhshanfar et al., 2004; Pirali-Kheirabadi et al., 2008). This is the first study to compare, the prevalence and intensity of parasite among pigeon species in the birjand area, South Khorasan of Iran. Categorization of sampled birds into adult pigeons and nestlings enabled the study to show that helminthes, H. columbae and P. canariensis were significantly more prevalent in adult than in
nestlings while *T. gallinae* and *Eimeria* sp. were significantly (p<0.05) higher in nestlings pigeons than in adults. The present findings are more or less similar pattern was previously observed line with observations by Msoffe et al. (2010). According to the various studies performed in different regions of the world, *Ascaridia columbae*, *Capillaria*, *Dispharynx*, *Hadjelita truncata*, *Syngamus* and *Tetramerae* sp. were commonly identified in pigeons (Gicic and Arslan, 2001; Razmi et al., 2007; Sari et al., 2008). The 2 species of nematoide encountered (*Ascaridia columbae* and *Hadjelita truncata*) were of low percentage prevalence.

This is probably due to the mode of infection as the infective egg dries off when the environment is harsh. Perhaps, most of the infective stages that got to the final host were through earth worms as transport host.

Despite their low prevalence, severe haemorrhagic enteritis, intestinal obstruction, reduction in egg production and subsequently death have been known to occur (Audu et al., 2004). *Hadjelita truncata* has been found in the gizzard of a number of bird species in Europe and Asia. The intermediate host are various beetles (Anderson, 2000). So far, there have been only 4 reports of the pigeons infestation with this parasite from Egypt (Tadros and Iskander, 1975), Iraq (Al-Attar and Abdul-Aziz, 1985), Cyprus (Appleby et al., 1995) and Iran (Razmi et al., 2007). *Ralliellinae magninumida* was shown to be an important cestode of pigeons. Although, this is generally considered to be a relatively harmless parasite, it will be interesting to study the reason of pigeons to be more susceptible to *Ralliellinae magninumida* a compared to other birds. Further investigations of health status, blood parameters and growth rate of pigeons will indicate the relative effect of these worms in pigeons. The presence of three species of *Ralliellinae* clearly support their cosmopolitan nature in chickens, guinea fowls, turkeys, pigeons, doves and bush fowls (Soulsby, 1982; Onyew et al., 2001; Audu et al., 2004; Derakhshar et al., 2004; Moghaddas et al., 2010). Ants of the genera *Pheidole* and *Tetramorium* including various beetles, termites, flies and other arthropods in addition to fruits and seeds form the major diets of dove and pigeon (Adang, 1999). The arthropod portion of the food by carrying the infective stages, serves as intermediate host (Mushi et al., 2000).

It may be therefore, right to postulate that the degree of prevalence is determined by levels of the infective stages present in the intermediate host and subsequently, their availability to the definitive host. The high prevalence of double infestation of the pigeons by *Columbicola columbae* and *Pseudolynchia canariensis*, compared with single infestation may be related to the fact that ectoparasites can cohabit without causing any harmful effects on each other. The interaction of 2 or more

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Table 1: Prevalence of helminth in nestlings and adults pigeons

<table>
<thead>
<tr>
<th>Helminth</th>
<th>Adults</th>
<th>Nestlings</th>
<th>Overall</th>
<th>Statistical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td><em>Ascaridia columba</em></td>
<td>14</td>
<td>24.13</td>
<td>3</td>
<td>6.88</td>
</tr>
<tr>
<td><em>Hadjelita truncata</em></td>
<td>2</td>
<td>3.44</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td><em>Ralliellinae magninumida</em></td>
<td>15</td>
<td>25.86</td>
<td>4</td>
<td>9.09</td>
</tr>
<tr>
<td><em>Ralliellinae achelobothroida</em></td>
<td>27</td>
<td>46.55</td>
<td>6</td>
<td>13.63</td>
</tr>
<tr>
<td>Coturnix digonospora</td>
<td>12</td>
<td>20.68</td>
<td>2</td>
<td>4.54</td>
</tr>
<tr>
<td>Total helminth</td>
<td>34</td>
<td>58.62</td>
<td>9</td>
<td>20.45</td>
</tr>
</tbody>
</table>

NS: Not Significant (p>0.05); S: Statistically significant (p<0.05)

Table 2: Prevalence of ectoparasites in nestlings and adults pigeons

<table>
<thead>
<tr>
<th>Ectoparasites</th>
<th>Adults</th>
<th>Nestlings</th>
<th>Overall</th>
<th>Statistical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td><em>Pseudolynchia canariensis</em></td>
<td>44</td>
<td>75.86</td>
<td>21</td>
<td>47.27</td>
</tr>
<tr>
<td><em>Columbicola columbae</em></td>
<td>63</td>
<td>74.13</td>
<td>38</td>
<td>86.86</td>
</tr>
<tr>
<td><em>Menopon gallinae</em></td>
<td>26</td>
<td>44.82</td>
<td>19</td>
<td>43.18</td>
</tr>
<tr>
<td><em>Laminosopyx cysticina</em></td>
<td>2</td>
<td>3.44</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Total ectoparasites</td>
<td>52</td>
<td>89.65</td>
<td>41</td>
<td>93.18</td>
</tr>
</tbody>
</table>

NS: Not Significant (p>0.05); S: Statistically significant (p<0.05)

Table 3: Prevalence of protozoa in nestlings and adults pigeons

<table>
<thead>
<tr>
<th>Ectoparasites</th>
<th>Adults</th>
<th>Nestlings</th>
<th>Overall</th>
<th>Statistical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td><em>Haemoproteus columbae</em></td>
<td>36</td>
<td>62.06</td>
<td>12</td>
<td>27.77</td>
</tr>
<tr>
<td><em>Trichomonas gallinae</em></td>
<td>18</td>
<td>31.03</td>
<td>41</td>
<td>93.18</td>
</tr>
<tr>
<td>Cryptosporidium</td>
<td>2</td>
<td>3.44</td>
<td>1</td>
<td>2.27</td>
</tr>
<tr>
<td><em>Eimeria</em> sp.</td>
<td>17</td>
<td>29.31</td>
<td>24</td>
<td>54.54</td>
</tr>
</tbody>
</table>

NS: Not Significant (p>0.05); S: Statistically significant (p<0.05)
ectoparasites on the same host may be said to be a low inter-specific competitive interaction characterized by simultaneous infestations that may not be detrimental to the 2 species. Diversity of bird ectoparasite assemblages may be related to many factors which may include home range, behaviour, size and roosting habit of the host. The results of this study confirmed the findings of other studies performed in some parts of the world (Senlik et al., 2005; Mushu et al., 2000; Petryszak et al., 2000). Total 2 bird (1.96%) showed the presence of the cyst mite (Laminosioptes cysticola) which were reported in pigeons and chicken (Toro et al., 1999; Eslami et al., 2009).

Total 2 Haemoproteus species, H. columbae and H. sacharovi, occur in pigeons. The vector of H. columbae is Pseudolynchia canariensis. Both H. columbae and P. canariensis are widely distributed in the world, especially in warm and temperate climates (Sousby, 1982). About 63.72% of pigeons examined were parasitized with P. canariensis. The range of pigeon flies (P. canariensis) recovered from a single pigeon was 1-5 flies.

Since, birds were caged together before delivery to the laboratory, it is possible that flies could have been transferred from bird to bird. Data on percentage of birds infected would not account for the variable and therefore, the ratio of flies recovered to number of birds examined was utilized to indicate fly population density. The results of this study are in line with previous finding (Gicik and Arslan, 2001; Sol et al., 2000) that older individuals have higher infections of haematozoan parasites (H. columbae) than younger ones.

There was a noticeable relationship between the prevalence of Haemoproteus columbae and its vector Pseudolynchia canariensis. The closeness in their percentage prevalence suggests that most of the vector harbored by the pigeons were probably carrying pathogens. A higher prevalence in adults might be the result of a longer time of exposure to the parasites. However, parasites prevalence in nestlings was also high in most of the studied populations which suggest that infections generally occurred at an early age.

The lower parasite intensity in adults on the other hand is to be expected if older birds acquire a certain degree of immunity against parasites (Merila et al., 1995). Alternatively, adults with high intensity of parasites could be under-represented in the populations due to their higher risk of mortality; this last hypothesis seems however, less probable in the case because existing evidence indicate that H. columbae rarely produces mortality in pigeons (Atkinson and van Riper, 1991). Trichomonas gallinae causes avian trichomoniasis and affects upper digestive and respiratory tracts (Levine, 1985). Avian trichomoniasis caused is a disease of young birds which may result in a high mortality in young pigeons within 10 days. A high incidence of latent infection (up to 90%) has also been reported (Sousby, 1982) where they can cause granulomatous lesions that occlude the oesophageal lumen, leading to the death of birds as a result of severe starvation. (Narcisi et al., 1991). Trichomonas gallinae was significantly higher in nestlings pigeons (93.18%) than in adults.

The reason for the high prevalence may be due to the fact that the transmission of the parasite occurs generally when the adults feed their young but can occur through food in feeders and water (Kocan and Kinsley, 1970). Adult birds may remain infected for a year or more and are a constant source of infection for their young (Sousby, 1982). The result from this study showing Eimeria to occur in 40.19% is considered to be high (Lawal et al., 2001).

In 29.31% of the adult pigeons and in 54.54% of the Nestling pigeons Eimeria oocysts were detected (p<0.05). Coccidiosis is one of the important protozoan diseases of birds. The disease has a subclinical course in adults but young pigeons exhibit such symptoms of clinical coccidiosis as fluffy feathers, anorexia and watery diarrhoea with mucus (Levine, 1985).

The reason for the high prevalence may be due to the fact that the pigeons in this part of the country are mainly kept on free range and also the housing they retire to are raised mud huts. This offers optimal conditions of temperature and humidity for the sporulation of the oocysts. Although, species identification of the Eimeria was not done in this study, earlier reports in other places have indicated the presence of Eimeria labbeana in majority of the samples (Taylor et al., 2007).

Total 4 species of Cryptosporidium were isolated from the birds: Cryptosporidium baileyi, C. meleagridis, C. parvum and C. galli (Sreter and Varga, 2000; Xiao et al., 2004). In addition, Cryptosporidium species that are known as water borne zoonotic protozoans seen in humans and many of the domestic animals are also encountered in pigeons (Rodriguez et al., 1997; Sari et al., 2008). Cryptosporidium infections commonly seen in the birds (2.94%) were reported to be found especially in young pigeons rarely at low rates (Rodriguez et al., 1997; Ryan et al., 2003; Sreter and Varga, 2000).

CONCLUSION

The present study showed that, helminthes and H. columbae were significantly more prevalent in adults than in the nestlings. The difference of ectoparasites (Columbicola columba and M. gallinae) were not
significant in adults and nestlings, *P. canariensis* and *H. columbae* were significantly more prevalent in adult compared with the nestlings. Mixed worm infections are less frequently seen than single worm infestations in pigeons.

This result indicates that pigeons could be less susceptible to mixed infections in comparison with chickens. Whether these have more significant effect on the health and growth rate of these birds remains to be investigated. From the parasite fauna seen in this study, it is imperative to institute an integrated parasitic control through constant changing of litter, regular use of anthelmintics, anticoicidials and dusting of birds with pesticides. It is also, important to educate the breeders of these birds on the need to adhere strictly to these control measures. These, perhaps will boost the production of domesticated pigeons, consequently augmenting the animal protein required.

**REFERENCES**


