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A study of ecto- and endo-parasites of domestic pigeons in Morogoro Municipality, Tanzania

P. L. M. Msoffe[1*], A. P. Muhairwa[1], G. H. Chiwanga[2] and A. A. Kassuku[3]

[1]Department of Veterinary Medicine and Public Health, Faculty of Veterinary Medicine, Sokoine University of Agriculture, P. O. Box 3021, Chuo Kikuu Morogoro, Tanzania.
[2]Ministry of Livestock Development and Fisheries, Veterinary Investigation Centre, Southern Highlands, P. O. Box 290 Iringa, Tanzania.
[3]Department of Veterinary Microbiology and Parasitology, Faculty of Veterinary Medicine, Sokoine University of Agriculture, P. O. Box 3019, Chuo Kikuu Morogoro, Tanzania.

A study was conducted to assess the prevalence of parasites of domestic pigeons in Morogoro Municipality, Tanzania. 100 nestlings and 100 adult pigeons were examined for the presence of ecto and endoparasites. 159 pigeons (79.5%) were infected with one or more species of gastrointestinal helminthes, 124 (62%) had one or more ectoparasites and 74 (37%) were infected with haemoparasites. The 3 subfamilies represented two cestodes and one nematode, whereas no trematodes were found. Three species of helminthes *Raillietina tetragona* (6%), *Raillietina echinobothrida* (63%) and *Ascaridia galli* (15.5%) were identified. Three different species of ectoparasites (*Pseudolynchia canariensis* (61.5%), *Menocanthus stramineus* (0.5%) and *Menopon gallinae* (0.5%), and 1 haemoparasite species *Haemoproteus columbae* were identified. Prevalence of gastrointestinal worms was significantly higher (P < 0.001) in adults than in nestlings. Nestlings appeared to be less susceptible to gastrointestinal cestodes but more susceptible to nematodes compared with adults. *P. canariensis* were found in both nestlings and adults pigeons while *M. stramineus* and *M. gallinae* were found in adult only. Prevalence of ectoparasites was not statistically significant (P < 1) between the two age groups. The prevalence of *H. columbae* was statistically higher (P < 0.001) in adults. Further studies are recommended in assessing the effects of the parasites on the pigeons' health and production.

Key words: Pigeons, free-range, gastrointestinal helminthiasis, prevalence.

INTRODUCTION

Domestic pigeons (*Columba columba*) are among poultry species kept in the Tanzania. Like other domestic poultry these are also part of subsistence farming done by most poor families in Tanzania. 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 Tanzania. However, in many parts of the country pigeons are seen daily scavenging for food together with other poultry species.

Investigations in chickens and ducks managed under similar conditions like pigeons have shown high prevalence of gastrointestinal helminths (Magwisha et al.,2002; Muhairwa et al., 2007) which impairs productivity and health of these birds. However, it envisaged that, understanding of parasitic diseases of pigeons will help in devising the measures to improve health and utility of these birds in Tanzania. Investigation elsewhere demonstrated the presence of gastrointestinal and haemoparasite (Sol et al., 2000; Adriano and Cordeiro, 2001). This study was therefore designed to gauge the occurrence of parasites (endoparasites, ectoparasites and blood) of pigeons in Morogoro Municipality of Tanzania.

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*Corresponding author. E-mail: msoffepl@giant.suanet.ac.tz.

MATERIALS AND METHODS

Study location

The study was conducted between January and March 2007 in Morogoro Municipality, Tanzania using 10 subunits of the municipality, namely Chamwino, Konga, Kihonda, Mafiga, Nanenane, Mwanza, Karume, Kiwanja cha ndege, Kilakala and Vibandani.

Sample size determination

A sample size of 100 nestlings and 100 adult pigeons was determined by method described by Canon and Roe (1982). With expected prevalence of 50% and the prevalence to be within 10 and 95% CI, a sample size of 100 was estimated for each age group. Age was determined by examining iris color and unmolted feathers as described by (Sol et al., 2000). After purchasing, pigeons were transported in cages to the Faculty of Veterinary Medicine, SUA-VET Clinic Laboratory where they were examined, bled, humanely killed by cervical dislocation and investigation of parasites was performed.

Investigation of the parasites

Examination of the pigeons and Haemoparasites investigation

The blood was collected from wing veins by using 2 ml syringe and needle, feathers in the axillary region were plucked to isolate wing vein and the site was disinfected by 70% methylated ethanol, and blood was poured into EDTA anticoagulant vaccutainer tubes. The blood smears were prepared, air dried and fixed with Methanol and stained with Giemsa.

Ectoparasites investigation

The ectoparasites were collected as described by Soulsby (1986), briefly after killing the pigeons by decapitation, 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.

Postmortem and gastro-intestinal parasites investigation

Gastro-intestinal parasites

The postmortem examination was done according to Fowler (1996), after decapitation, the abdominal and thoracic cavity were opened, followed by systemic autopsy examination which include, the oesophagus to the gizzard, the small intestine (duodenum, jejunum, and ileum), the caeca, and the ileocaeco-colic junction to the cloaca. Each section was opened longitudinally and the contents carefully washed through a 100 µM test sieve. The mucosa was scraped to collect the helminthes embedded in the mucosal layer. Finally, the contents were examined under stereomicroscope and all helminthes were counted before being fixed in 70% ethanol for further identification Soulsby, (1986).

Identification of parasites

Haemoparasites

The haemoparasites were identified by examining the blood smear under oil immersion (objective 100 × magnification) as described by Soulbsy (1986) using a light microscope.

Gastro-intestinal parasites

The helminthes were cleared in lactophenol and examined for morphology under light microscope at 10× magnification. All parasites were identified using the helminthological key Soulsby (1982).

Data capture and management

Prevalence (P=d/n) was calculated where P is the prevalence, d is the number of individuals having a disease at particular point in time and n is the number of individuals in the population at risk in time of every single species was calculated according to Thrustfied (1995). Chi squire analysis was used to compare prevalence of parasites between the adults and young pigeons using MS Excel® programme.

RESULTS

Parasite species

Out of a total of 200 pigeons (100 nestlings and 100 adults pigeons) examined, 159 (79.5%) were infected with one or more species of helminthes, 124 (62%) had one or more ectoparasites and 74 (37%) were infected with Hemoparasites (Table 1). A total of 3 different worms' species were identified in small intestine, 3 different ectoparasites and 1 Haemoparasite species. The prevalence of parasite species identified in nestlings and adults pigeons is shown in Table 1. In total 2 species of cestodes belonging to subfamilies, Raillietinae and 1 species of nematode belonging to subfamily Ascaridae were found in both nestlings and adults. No trematodes were found in the study and no endoparasite was found in gizzard and caeca. The 3 different species of ectoparasites identified were *Pseudolynchia canariensis* (pigeon fly) found in both nestlings and adults while *Menocanthus stramineus* and *Menopon gallinae* were found in adult only. The haemoparasite species identified were *Haemoproteus columbae* that was found in both nestlings and adult pigeons.

Prevalence measures of association

The analysis showed that worms were significantly (P < 0.001) more prevalent in adults than in the nestlings. *H. columbae* was significantly (P < 0.001) higher in adult pigeons than in nestlings while the ectoparasites (*P. canariensis*, *M. stramineus* and *M. gallinae*) the difference were not significant (P > 0.05) in adults and nestlings. Prevalence of *P. canariensis* and *H. columbae* were statistically significant (P < 0.001) higher in adult pigeons than the nestlings.

Table 1. Prevalence (%) of ecto and endoparasites in nestlings and adults pigeons in Morogoro Municipality.

Ecto- and endo-parasites	Nestlings		Adults		Overall prevalence	Statistical significance
	n	%	n	%	%	P < 0.05
Helminth						
R. tetragona	3	3	9	9	6	NS
R. echinobothrida	44	44	82	82	63	*
A. galli	21	21	10	10	15.5	*
Total worms	65	65	94	94	79.5	*
Ectoparasites						
P. canariensis	60	60	63	63	61.5	NS
M. stramineus	0	0	1	1	0.5	NS
M. gallinae	0	0	1	1	0.5	NS
Total ectoparasites	60	60	64	64	62	NS
Blood parasites						
H. columbae	11	11	63	63	37	*
Mixed *P. canariensis* and *H. columbae*	4	4	42	42	23	*
Mixed *Raillietina* and *A.galli*	3	3	7	7	5	NS

NS - Not significant. *p < 0.05 statistically significant (statistically significant at p<0.05).

Table 2. Mean worm burden, standard deviation and range of parasites in nestlings and adult pigeons.

Parasites	Nestlings			Adults			
	Mean	SD	Range	Mean	SD	Range	P < 0.05
Raillietina tetragona	3.33	2.517	1-6	2.22	1.394	1-5	NS
Raillietina echnobothrida	2.1556	1.62307	1-8	3.77	3.096	1-18	*
Ascaridia galli	16.47	37.321	2-160	2.67	2.000	1-7	NS
Pseudolynchia canariensis	2.31	1.500	1-7	2.83	1.833	1-9	NS
Menocanthus stramineus	-	-	-	2.00	-	2	NS
Menopon gallinae	-	-	-	1.00	-	1	NS

NS - Not significant. *- Statistically significant.

Worm burden measures of association

Student t-test showed that for *Raillietina echinobothrida* mean number of worms per infected bird in adults pigeons was statistically and significantly higher (p < 0.05) than the nestlings. Statistical comparison of mean number of worms per infected birds, between adults and nestlings was not significantly (p > 0.05) different for *Raillietina tetragona*, *Ascaridia galli* and other ectoparasites that is *P. canariensis, M. stramineus* and *M. gallinae* (Table 2).

DISCUSSION

The present investigation demonstrated a total of 7 species of parasites which included 1 species of nematode, 2 species of cestodes, 1 species of louse fly (Pseudolynchia) and 1 species of haemoparasites, making the first record of pigeon's parasites in Tanzania. Although majority of pigeons carried single worm species, mixed infection of up to two species were recorded and the total number of worms per bird ranged between 1 - 160. 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.

The present findings are in line with observations by Permin et al. (1997) in chickens and Muhairwa et al. (2007) in ducks which showed 100 and 52% respectively of gastrointestinal heliminths, no trematode was demon-strated. These findings suggests that pigeons could be slightly resistant compared to chickens and more suscep-tible than ducks to helminthes infestations. Contrary to

Muhairwa et al. (2007), cestodes were demonstrated in both nestlings and adult pigeons in present study. However, longitudinal studies in chickens, ducks and pigeons are required to conclude these observations. Similar to chickens, ducks seasonal variations in the availability of free water could have limited exposure of ducks to snails, which are carriers of trematodes, could partly explain their absence in this study (Muhairwa et al., 2007).

R. echinobothrida 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 *R. echinobothrid*a compared to ducks and other birds. Further investigations of health status, blood parameters and growth rate of pigeons will indicate the relative effect of these worms in pigeons.

A. galli, which are potentially pathogenic, worms were not shown to have clear physical effect on the health status of ducks. Investigation by Permin et al. (1997) showed that body condition score of all chickens infected with worms were below normal. Attempts to correlate the body condition with burden of helminthes were not successful in the present study because data on performance of pigeons could not be obtained. However, the present study clearly showed that *A. galli* is more significant parasitic condition in nestlings than in adult pigeons in Tanzania and wherever control measures for endoparasites are in place these should be considered.

Studies which has been done in other countries on the *H. columbae* and its vector *P. canariensis* (Klei and Deguist, 1975) documented that 16% of pigeons examined were parasitized with *P. canariensis* which is contrary to present study which indicate a higher percentage (that is 61.5%) of examined birds were infected. The range of pigeon flies (*P. canariensis*) recovered from a single pigeons was 1 - 9 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 (that is *H. columbae)* than younger ones. 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 our case because existing evidence indicate that *H. columbae* rarely produces mortality in pigeons (Atkinson and Van Riper 1991).

The present study showed that, helminthes and *H. columbae* were significantly more prevalent in adults than in the nestlings. The difference of ectoparasites (*P. canariensis*, *M. stramineus* 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 finding 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.

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