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Prevalence of parasitic-infestation in domestic pigeons at Malakand region, Khyber Pakhtunkhwa, Pakistan

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Abstract

As there is no data available on parasitic infestation on pigeons in and around Malakand division, the present study was therefore designed to determine the prevalence of ecto- and endo-parasites of domestic pigeons at Malakand region, KPK, Pakistan. A total of 15 adult pigeons (10 males and 5 females) were examined. Out of the total pigeons examined, 13 were found to be infected with three species of ecto-parasites and 10 pigeons were found to be infected with three species of endo-parasites. The three species of ecto-parasites identified were lice of the genera *Columbicola columbae* 86.6% (n=13/15), *Campanulotes bidentatus* 46.6% (n=7/15) and *Menacanthus stramineus* 33.3% (n=5/15) with overall prevalence of 86.66%. No ticks and mites were recorded. Single ecto-parasitic infection (40%) was more prevalent as compared to double infection (13.33%) and triple infection (33.33%). The three species of endo-parasites identified were two species of cestodes includes *Raillietina* spp. 60% (n=9/15) and *Cotugnia* spp. 13.3% (n=2/15). Only one nematode *Ascaridia* spp. Constituted the lowest prevalence of 1(6.66%) was reported. No trematodes and acanthocephalan were reported. No significant difference (P=0.0194 for lice and P= 0.5166 for endo parasites) was found between examined and infected of male and female pigeons. The pigeons had higher prevalence of single endo-parasitic infection (53.33%) as compared to double infection (33.33%). As parasites are responsible for transmission of various infectious agents and are also responsible for various clinical and sub-clinical diseases we recommend further studies in assessing the prevalence of pigeon's parasitic infection and effect of parasites on pigeon's health and production to assist the clinicians regarding epidemiological forecasting and aware the farmers to take appropriate measures against them.

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Introduction

Pigeons of the order Columbiformes are ubiquitous birds and can be found in every town and city of the world. *Columba livia* is a species that descends from wild rock pigeons (Marques *et al.,* 2007). Pigeons feed on a wide variety of food items, which include grains, slugs, earthworm and insects (Adang, 1999). Pigeons are widely sold or traded in Malakand region to augment income. Pigeons live side by side with human and other animal species in nature (Harlin, 1994).

They are used as a source of food, hobby and experimental purposes (Sari *et al.,* 2008). Pigeons can carry ecto-parasites; such as lice, ticks and mites, and endo-parasites; such as nematodes, cestodes, trematodes and protozoans. It has been reported that they constitute a major source of infection and transmission of diseases. Several health problems can affect pigeon where ecto- and endo-parasitic infections play a major role (Marques *et al.,* 2007).

Both ecto- and endo-parasites have been involved in causing morbidity and mortality in pigeons (Cheng, 1973; Soulsby, 1982). Infection results in weight loss, anemia, retarded growth, fertility disturbance, emaciation, gut epithelium complications and reduction in immune responses of host against various diseases (Urquhart *et al.,* 2000). Such complications in young pigeons eventually lead to death (Basit *et al.,* 2006). Humans are infected by fecal dust from cages or from sites that been contaminated with dry feces, urine and other droppings (Eljadar *et al.,* 2012). Pigeons act as a reservoir host or carrier and an important source of infection for other avian host, which share the common parasitic fauna (Borji*et al.,* 2012). Several research works have been conducted on ecto- and endo-parasites of pigeon at different areas of Pakistan but no such study has been conducted on prevalence of ecto-parasites and endo-parasites of pigeons at Malakand region. The present study was therefore designed to determine the prevalence of ecto-parasites and endo-parasites of domestic pigeons at Malakand region.

Materials and methods

Study area

The study was conducted from June 2015 to June 2016, involving random selection of 15 adult pigeons (10 males and 5 females) from local markets at Malakand region, Khyber Pakhtunkhwa, Pakistan.

Examination for ecto-parasites

Ecto-parasites were collected from live pigeon by placing them in a plastic bag with its head outside. The pieces of cotton dipped in chloroform were placed in the bag. After 15-20 minutes, the bag was shaken thoroughly. By doing so, dying ecto-parasites detached and fell off. The pigeon was then removed from bag and ecto-parasites were collected from the bag. Then pigeon was placed on a white tray and was carefully examined. The feathers were separated in order to expose the skin for collection of any attached parasites. The collected ecto-parasites were preserved in 70% alcohol for identification purposes. Later, all the samples were examined under stereo-microscope and identified according to the (Cheng, 1973; Soulsby, 1986).

Examination for endo-parasites

The pigeons were slaughtered and dissected one by one from cloaca up to the neck region. The digestive tract was removed and various sections; esophagus, crop, proventriculus, gizzard, duodenum, small intestine, caecum and rectum were separated. The separated parts were put in different petri dishes, containing physiological saline solution for 20 minutes to facilitate detachment of any attached worms. Each section was then cut longitudinally with the help of scissors and opened to expose its content. The removed contents were investigated to collect helminths, if found, were detached with a pair of forceps and thin brushes. The mucosa was scraped to collect the helminths embedded in mucosal layer. The worms collected were then counted. Initial identification of helminths was done by stereo microscope. Nematodes were preserved in 70% alcohol and 5% glycerin while cestodes were preserved in 10% formalin. Trematodes and acanthocephalan components were entirely absent.

For preparation of permanent slides, the desired specimen was kept on slide covered by cover slip and tied with a fine thread. The slides were kept in AFA solutionfor 24 hours in order to fix the specimens. Then they were cleared with lacto phenol, stained in borax carmine, washed to remove excess stain, dehydrated in a series of alcohol, rinsed with xylene if needed, cleared with clove oil and permanently mounted in Canada balsam. Finally the slides were examined under light microscope and identified according to the keys provided by (Soulsby, 1986; Cheng, 1973; Ruff, 1984; Ruprah, *et al.,* 1986). The prepared slides were labelled and deposited to the Parasitology Laboratory in the Department of Zoology, University of Malakand for future studies.

Statistical analysis

The data obtained was analyzed statistically by Graph Pad Prism 5. P value was calculated among the host examined and that of infected in male and female birds. The unpaired two tailed P value was calculated.

Results

Ecto-parasites

Out of 15 (10 males and 5 females) pigeons examined, 13 (9 males and 4 females) were found to be infected with three species of ecto-parasites with overall prevalence of 86.66%. The ecto-parasitic infection rate in male pigeons was 60% and in female pigeons was 26.66% (Table 1).

Table 1. Prevalence of ecto- and endo-parasitic infection and un-infection rate of studied sample in relation to their sex.

Infection type	Sex	No. of host examined	No. of host infected (%)	P Value
Ecto-parasitic infection	Male	10	9(60)	0.0194
	Female	5	4(26.6)	
Total		15	13(86.6)	
Endo-parasitic infection	Male	10	7(46.6)	0.5166
	Female	5	3(20)	
Total		15	10(66.6)	

The three species of ecto-parasites identified were lice including *Columbicola columbae, Campanulotes bidentatus and Menacanthus stramineus*. No ticks and mites were found in examined pigeons. *Columbicola columbae* was present in all 13 (86.66%) infected pigeons. *Campanulotes bidentatus* was present in 7 (46.66%) pigeons while *Menacanthus stramineus* was present in 5(33.33%) pigeons. The prevalence and intensity of lice species is summarized in Table 2.

Table 2. Prevalence and Intensity of ecto and endo-parasitic infection in examined pigeons (N=15).

Parasites recovered	Species	No. of host infected	Site of recovery	Prevalence (%)	Total no. of parasites collected	Intensity (%)
Lice	*Columbicola columbae*	13	Wing and tail feathers	86.66	83	6.38
	Campanulotes bidentatus	7	Down and contour feathers	46.66	46	6.57
	Menacanthus stramineus	5	Head, neck and body	33.33	25	5
Nematode	*Ascaridia spp.*	1	Small intestine	6.66	5	5
Cestodes	*Raillietina spp.*	9	Small intestine	60	126	14
	Cotugnia spp.	2	Small intestine	13.33	15	7.5

The pigeons had higher prevalence of single ecto-parasitic infection (40%) as compared to double (13.33%) and triple infections (33.33%) as shown in Table 3. *Columbicola columbae* was removed from tail and wing feathers. *Campanulotes bidentatus* was removed from down and contour feathers of skin while *Menacanthus stramineus* was detached from head, neck and body.

Table 3. The frequency distribution of single and mixed ecto- and endo-parasitic infections in examined pigeons (N=15).

Infection pattern	Parasites	Prevalence (%)
	Ecto-parasites	
Single infection	*Columbicola columbae*	6 (40)
Double infection	*Columbicola columbae* + *Campanulotes bidentatus*	2 (13.33)
Triple infection	*Columbicola columbae* + *Campanulotes bidentatus* + *Menacanthus stramineus*	5 (33.33)
Total infection		13 (86.66)
Single infection	Endo-parasites	
	Raillietina spp.	7 (46.66)
	Cotugnia spp.	1 (6.66)
Double infection		8(53.33)
	Raillietina spp. + *Cotugnia spp.*	1 (6.66)
	Raillietina spp. + *Ascaridia spp.*	1 (6.66)
		2(13.33)
Total infection		8+2=10 (66.66)

Endo-parasites

Ten (7 males and 3 females) pigeons were found to be infected with three species of endo-parasites with overall prevalence of 66.66%. The endo-parasitic infection rate in male pigeons was 46.6% and in female pigeons it was 20% (Table 1). The three species of endo-parasites identified were two cestodes includes *Raillietina spp.*, *Cotugnia spp.*, and one nematode includes *Ascaridia spp.* .No trematodes and acanthocephalan were found in examined pigeons. *Raillietina spp.* was present in 9 (60%) pigeons. *Cotugnia spp.* was present in 2 (13.33%) pigeons while only 1 (6.66%) pigeon was infected with *Ascaridia spp.*

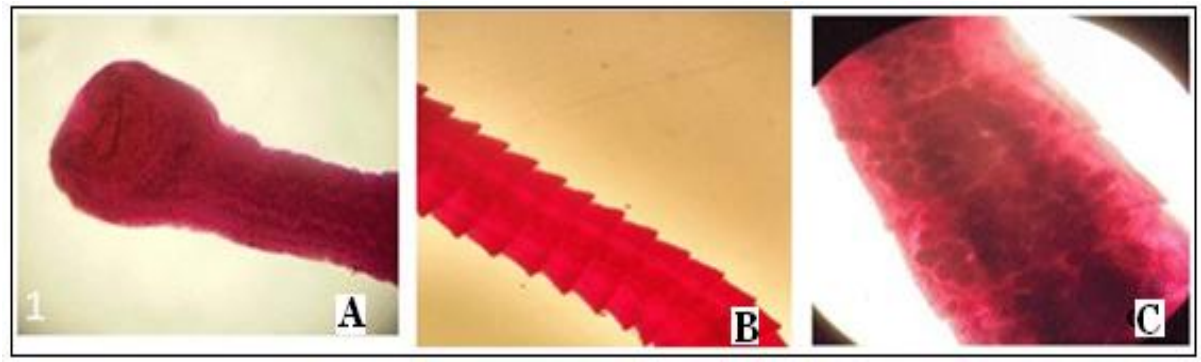

Fig. 1. *Raillietina spp.* A. Scolex showing suckers and rostellum armed, B- Mature segments, C- Gravid proglottids occupied by uterine eggs.

The prevalence and intensity of cestodes and nematode is summarized in Table 2. The pigeons had higher prevalence of single infection (53.33%) as compared to double infection (33.33%) as shown in Table 3. All the endo-parasites were collected from small intestine.

Discussion

Pigeons kept under poor management and less hygienic environment possess high parasitic infection rate than that of good management and proper hygiene. Environmental factors, social customs and personal habits are the factors responsible for distribution of parasites. The results of the current study are corroborated with previous reports in literature by scientists working in different geographical regions of the world. The prevalence of *Columbicola columbae* of the current study are in line with the findings by Adang *et al.* (2009), Radfar *et al.* (2012) and Foronda *et al.* (2004) who recorded 60%,

79.41% and 94% prevalence of *Columbicola columbae*in Nigeria, East of Iran and Tenerife respectively. Begum and Sehrin (2011) reported the same prevalence of *Menacanthus stramineus* (46.66%) in Bangladesh that was reported by us. Musa *et al.* (2011) and Dranzoa *et al.* (1999) found 33.33% and 64.7% prevalence of *Menacanthus stramineus* in Bangladesh and Uganda respectively. The prevalence of *Campanulotes bidentatus* was 7.3% in male and 1.9% in female by Al-Barwari and Saeed (2012) who was working on pigeons in Iraq.

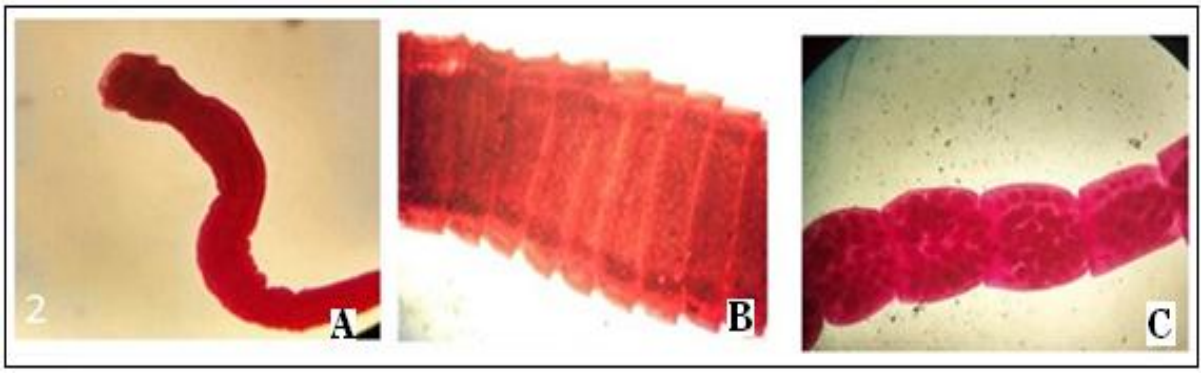

Fig. 2. *Cotugnia spp*. A- Scolex, B- Mature segments showing reproductive segments, C- Gravid proglottids filled with uterine eggs.

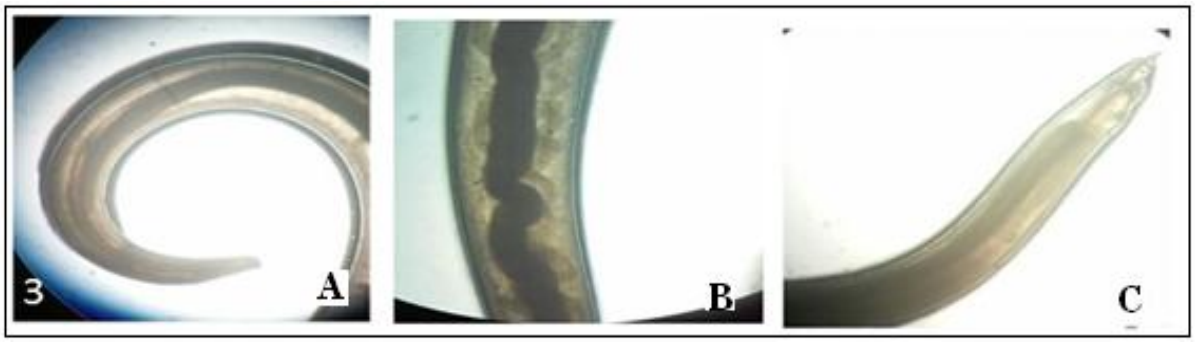

Fig. 3. *Ascaridia*spp. A- Head, B-Rest of the body other than head showing digestive system and reproductive system, D- posterior region along with tail.

The prevalence of *Raillietina spp*. (60%) of the current study are in line with the findings of other researchers. According to Abed *et al.* (2014), the prevalence of *Raillietina spp* in pigeons of Iraq was 46.3%.

The prevalence rate of *Raillietina spp*. was 61.76% by Diakou *et al.* (2013) who was working on feral pigeons in Northern Greece. Mushi *et al.* (2000), reported 75% prevalence of *Raillietina* species, who studied domestic pigeons in Botswana. In the current investigation the prevalence of *Cotugnia spp*. in pigeons from Malakand region was 13.33%. Variation in the prevalence of *Cotugnia* species of the current investigation is found with reports of other researchers throughout the world. According to Abed *et al.* (2014) the prevalence of *Cotugnia spp*. was 20% in pigeons of Iraq. The prevalence rate of *Cotugnia intermedia* was 21% and *Cotugnia cuneata* was 25% by Al-Bayati (2011) and Musa *et al.* (2011) in pigeons of Diyala Province and Bangladesh respectively. Radfar*et al.* (2012) found 13.79 % prevalence of *Cotugni adignophora* in pigeons of Iran, which is nearly similar to prevalence reported in the current experiment.

The prevalence of *Ascaridia spp*. (6.66%) are in line with the findings by Sari *et al.* (2008) who reported 5.1% prevalence of *Ascaridia columbae* in pigeons of Turkey. Bahrami *et al.* (2011) found 4% prevalence of

Ascaridia columbae who was working on pigeons in Iran. The variation in prevalence of parasites in pigeons suggests that the distribution and extent of parasitic infection at different geographical areas is quite variable depending upon their living conditions and management practices.

Fig. 4. *A-Columbicola columbae B-Campanulotes bidentatus C-Menacanthus stramineus.*

Conclusion

From the parasites seen in this study it is important to suggest precautions and possible measurement for control of pigeon parasites, including dusting of pigeons with pesticides, good management and proper hygiene; also to aware public about disease transfer by close association with pigeons.

As parasites are responsible for transmission of various infectious agents and are also responsible for various clinical and sub-clinical diseases we recommend further studies in assessing the prevalence of pigeon's parasitic infection and effect of parasites on pigeon's health and production to assist the clinicians regarding epidemiological forecasting and aware the farmers to take appropriate measures against them.

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