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ORIGINAL RESEARCH ARTICLE

Comparative Study on the Prevalence Rate of Helminth Infection in Domestic Pigeon (*Columba livia domestica*) and Brown Wild Pigeon (*Spilopelia senegalensis*) in Kano Metropolis

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ABSTRACT

This study examined the incidence of endoparasitic helminths in domestic and wild pigeons in Kano State Metropolis. A total of 144 pigeons (72 domestic and 72 wild) were examined for helminth parasites. According to the findings, endoparasitic helminth infections were found in 29.1% of domestic pigeons and 12.5% of wild pigeons. The most common helminth parasites found in domestic pigeons were *Trichuris gallinae* (41.7%) and *Diphylidium noctuae* (33.3%), while in wild pigeons, the most common helminth parasites were *Calliobothrium verticillatum* (77.8%) and *Diphylidium noctuae* (11.1%). The study also revealed notable variations in the helminth parasite prevalence rates among Kano State Metropolis's various Local Government Areas in Kano State Metropolis. A total of 203 parasites were collected, consisting of 131 cestodes and 72 nematodes. The research findings emphasize the significance of parasitological surveillance along with control steps to prevent the dissemination of helminth parasites in pigeons and other birds in the region.

ARTICLE HISTORY

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Helminths; Pigeons; Prevalence; Cestodes; Nematodes

INTRODUCTION

People rear domesticated birds for their feathers, meat, or eggs. Typically, these birds belong to the Order Galliformes, especially the superorder Galloanserae (fowl), which includes turkeys, quails, and chickens (Poule, 2021). Poultry refers to any domesticated bird raised for its intended use in captivity. Historically, this term has been applied to wildfowl (Galliformes) and ducks (Anseriformes), but not to birds that are kept in cages, such as songbirds and parrots. "Poultry" is the name used to describe domestic birds farmed for their meat or eggs, including chickens, turkeys, geese, and ducks. It also refers to the meat of these birds that is consumed as food (Mayer *et al.*, 2012).

The *Columba livia domestica*, or domestic pigeon, is a bird species that is closely associated with people and, more recently, has been employed as a lab animal (El-dakhly *et al.,* 2019). A subspecies of pigeon, *(Columba livia domestica or Columba livia Forma domestica)* is descended from the rocky dove. The rocky dove, also referred to as the rock pigeon, is the ancestor of the domestic pigeon (*Columba livia domestica* or *Columba livia Forma domestica*). The earliest bird to be domesticated. The domestic pigeon (*Columba livia domestica or Columba livia Forma domestica*) is descended from the rock dove, which is also known as the rock pigeon. Pigeon domestication dates back over 5,000 years, according to Egyptian hieroglyphics and Mesopotamian cuneiform writings. In 2018, Howstuffworks.

Pigeons may have been domesticated as early as 10,000 years ago, according to research (Poule, 2021). Pigeons have produced considerable contributions to humanity, particularly during wartime (Lawal *et al.,* 2020). Pigeons' capacity to hominate has been used in warfare by using them as messengers. So-called war pigeons have sent many important messages, and some have even received decorations for their contributions.

But according to taxonomy, the wild pigeon is called *Spilopelia senegalensis*, or laughing dove. Any bird that is not a chicken or a confined bird is generally considered a wild bird. They are usually the birds that visit your backyard feeders in quest of mealworms and seeds, chirping outside your window in the spring, and tapping on tree trunks while you explore forested paths. *Spilopelia senegalensis*, the laughing dove, was freed from the Perth Zoo in 1898. The small pigeon has established itself in the wild and is a resident breeder that uses resistance throughout Western Australia, South Asia, Africa, and the Middle East. Pairs of this tiny long-tailed dove are closely related to the

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spotted dove (*Spilopelia chinensis)*, which is distinguished by a necklace with black and white checks. (birdlife, 2018). While the small brown dove is a common name in Asia, Senegal dove, palm dove, and laughing turtle dove are some other names.

While schistosomiasis is contracted by swimming or wading in contaminated water, hookworm is most commonly contracted directly through the soles of the feet, typically in areas near open defecation and latrines. On the other hand, the term "helminth" is derived from the Greek word "helminth" (worm). Helminths are worm-like organisms that live and feed off living hosts. The primary means by which humans and animals can contract helminths is by consuming contaminated feces through food, water, or soil. Morbidity from helminth infections, including anemia, is determined by the intensity of the infection (number of worms in the gut) and the duration of the infection (Hall, 2008; Crompton, 1993). Moderate to heavy infections with hookworm are strongly associated with anemia (Hall, 2008; Roche and Layrisse, 1966). The term "helminth" refers to various worms that live as parasites in both human and animal bodies. These parasites can cause significant health issues, particularly in regions with poor sanitation and limited access to healthcare. Preventive measures, such as improving water quality and promoting hygiene education, are crucial in reducing the prevalence of helminth infections and their associated complications. The severity of the illness (the number of worms in the stomach) and the length of the infection define the morbidity from helminth infections, which includes anemia (Hall, 2008; Crompton, 1993). Anemia is closely linked to moderate to severe hookworm infections (Hall, 2008; Roche et al., 1966). The word "helminth" describes a broad range of worms that inhabit both human and animal bodies as parasites. These parasites have the potential to seriously harm people's health, especially in areas with inadequate access to healthcare and poor sanitation. Reducing the prevalence of helminth infections and the difficulties they cause requires preventive actions, including enhancing water quality and encouraging hygiene education.

Helminthology is the study of diseases caused by helminth parasites (WHO,2004). Helminth parasites are parasitic worms belonging to the phylum Platyhelminthes (flatworms) and Nematoda (roundworms) (WHO, 1997). Living and feeding on living hosts, they provide protection and sustenance while interfering with their hosts' ability to absorb nutrients, which leads to illness and weakness (WHO, 1997). Nevertheless, parasitic helminths have a serious negative impact on these birds by interfering with their ability to digest and absorb food, which results in stunted growth, malnourishment, decreased egg production, weakened immune systems, and even mortality (Babazadeh et al., 2014).

Kano State is home to a significant population of domestic and wild pigeons. Domestic pigeons are commonly raised and consumed as a source of meat by the local population. Despite their economic and nutritional importance, pigeons are susceptible to various diseases, including infections caused by endoparasitic helminths. Previous studies have investigated the frequency of intestinal helminth parasites in Kano State's domestic pigeons (Mohammad et al., 2019). However, there isn't enough information regarding the parasitic status of wild pigeons in the region. This knowledge gap concerning the frequency of endoparasitic helminth infections in wild pigeons in Kano Metropolis justifies the need for a study to bridge this gap. To evaluate and examine the prevalence rates of endoparasitic helminth infections in domestic and wild pigeons in Kano City, this comparative study was conducted.

MATERIALS AND METHODS

The Study Area

Kano metropolis, selected as the study area, lies between latitudes 110 ° 25' N and 12 ° 47' N, and Longitudes 80 ° 22' E to 80 ° 39' E, at an elevation of 472 meters above sea level. Kano city is surrounded by the local government areas (LGAs) of Madobi and Tofa to the southwest, Gezawa to the east, and Dawakin Kudu and Minjibir to the northeast. The study area comprises eight LGAs, including Dala, Fagge, Gwale, Kano Municipal, Nassarawa, Tarauni, Ungogo, and Kumbotso local governments (Ayila et al., 2014). After Lagos and Ibadan, Kano is Nigeria's third-largest city. 2,826307 people are living there (NPC, 2006). Kano State as a whole has historically been a commercial and agricultural state and is also among Nigeria's most advanced industrial cities. Hence, it is known as the centre of commerce (Olarenwaju, 2001).

Determination of Sample Sizes

The sample size for this investigation was initially calculated using a standard formula. However, the resulting sample size was found to be excessively large, posing significant conservation concerns. In light of these concerns, it was decided to adopt a more conservative approach. The sample size employed in this study is based on the work of Muhammad *et al.* (2019), who conducted the first research on pigeons in Kano State. Their sample size was deemed sufficient for this study, and it lessened the possible harm to the pigeon population. For this investigation, 144 pigeons in total were sampled, consisting of 72 wild pigeons and 72 domestic pigeons.

Pigeon Samples

A total of 144 birds, 72 domestic and 72 wild pigeons, were gathered from various locations throughout the Nigerian city of Kano metropolis, between January to September of 2024. Through the use of a handheld tour carried out during the day, nine pigeons from the entire understudy area were gathered each month; the wild pigeons were captured using traps, while the domestic pigeons were gathered from households. The intestinal contents were analyzed in the Faculty of Science Parasite Biodiversity Laboratory (PBL), Northwest University, Kano State. Nigeria is known for the presence of intestinal helminths (Nematodes and Cestodes).

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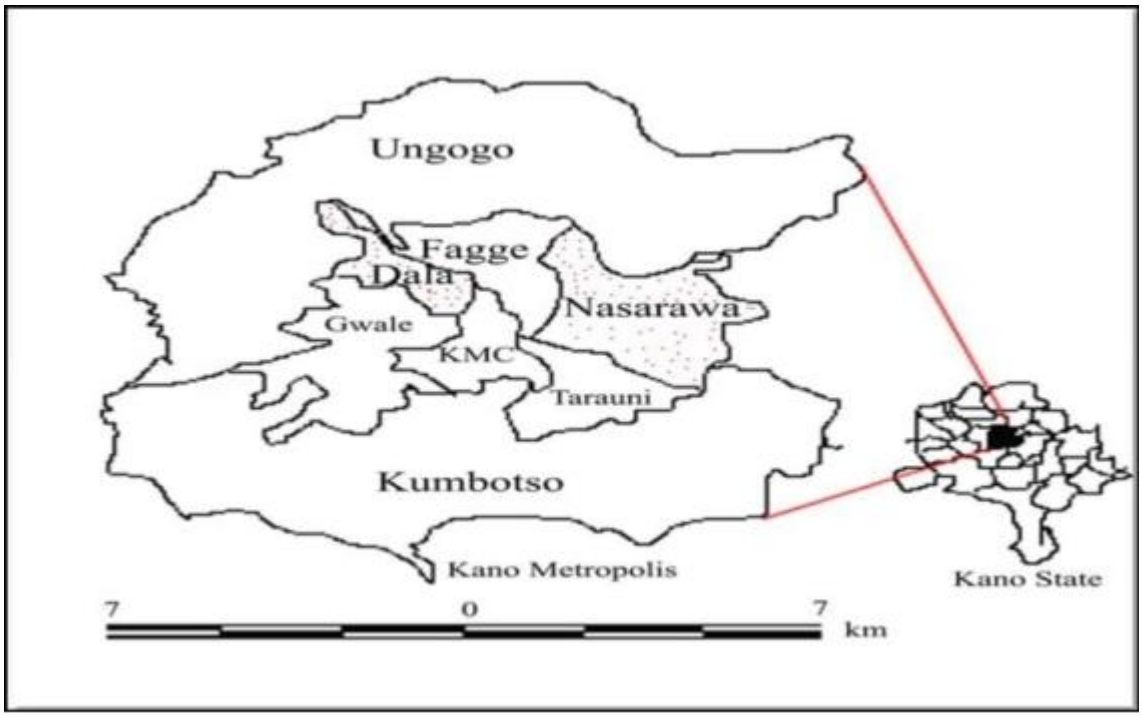

Figure 1: Map of Study Area

Isolation and Diagnosis of Helminths

The birds were killed in a humane manner in accordance with standard animal welfare protocols. Immediately after slaughter, the birds were dissected and necropsied in the laboratory to reveal the intestines, following the process described by Fatihu *et al.* (1991). The abdominal cavity was carefully opened, and the gastrointestinal system was carefully removed and position on a clean, sterile surface. A pair of sterile scissors was used to cut off the distal section of the digestive tract, which included the rectum, large intestine, and small intestine. The severed intestinal segment was then put in a sterile 0.85% Physiological Saline Solution (PSS) in a petri dish, which helped to maintain the viability of the parasites and prevent dehydration. The gut mucosa was carefully scraped with the use of sterile microscopy slides to release any attached parasites. The scraping process was repeated several times to ensure that all parasites were dislodged. The scraped material was then collected and placed in a separate sterile container. The cestode parasites (tapeworms) were carefully collected from the intestinal contents using a fine, sterile brush. The collected parasites were then fixed to maintain their morphology and avoid degradation; they were fixed in a hot A.F.A. solution (Alcohol 70° GL, 93 ml; Formaldehyde 5 ml, Acetic acid, 2 ml) that had been preheated to 60°C before the parasites were added.

In contrast, the nematode parasites (roundworms) were fixed in 70% ethanol solution for preservation and later identification. The ethanol solution helped to dehydrate the parasites, making them more stable for long-term storage. All the fixed parasites were then labeled and stored in separate containers for further examination and identification.

RESULTS

Figures 2, 3, 4 and 5 as well as Tables 1, 2, 3, 4, 5, 6, 7, and 8 provide an illustration of the study's findings. Nine wild pigeons (12.5%) and 21 domestic pigeons (29.1%) out of the 144 pigeons (72 domestic and 72 wild) that were analyzed were determined to be infected between January 2024 and August 2024 ($P < 0.05$). Because of the materials they eat and their capacity to spread parasites to one another, domestic pigeons may be more contagious than wild pigeons in this region, as evidenced by the difference in the prevalence of parasitic infection between the two groups. The reduced incidence of infection in wild pigeons, on the other hand, might be because of their propensity to roam great distances in pursuit of food, which lowers the number of intermediate parasite hosts.

Table 1 presents the frequency of endoparasitic helminth infection in pigeons, both domestic and wild. The results reveal a significant difference ($p=0.0043$) in infection rates between domestic (29.1%) and wild pigeons (12.5%). Domestic pigeons exhibited approximately 2.33 times higher infection rates than their wild counterparts. This disparity suggests potential environmental, dietary, or management factors contributing to increased infection susceptibility among domestic pigeons. Domestic pigeons showed significantly higher infection rates (29.17%) than

wild pigeons (12.5%). The odds of infection are 2.83 times higher in domestic pigeons.

Table 2 shows the distribution of endoparasitic helminth parasites in domestic and wild pigeons. Domestic pigeons harbored significantly more parasites (150) than wild pigeons (53), with a 2.83-fold higher prevalence (p=0.0043,x2=8.142). Cestodes predominated (131), comprising 64.2% of wild pigeon infections. Nematodes accounted for 35.3% and 35.8% respectively. A chi-square test was performed to determine if there was a significant association between the type of pigeon and the type of parasite. The results showed no significant association ($\chi 2 = 0.002$, df = 1, p = 0.968). The proportions of pigeons infected with cestode and nematode parasites were compared between domestic and wild pigeons. The results showed no significant difference in the proportions of infected pigeons between the two groups.

Table 3 shows significant seasonal variations in endoparasitic helminth prevalence rates (16.6% dry,41.6% rainy) than wild pigeons (5.5% dry, 19.4% rainy). Chi-squared analysis revealed significant differences between domestic/wild pigeons (p=0.012, x2=6.43) and dry/rainy seasons (p=0.001, x2=10.53), indicating increased susceptibility in domestic pigeons and seasonal fluctuations. A chi-square test revealed a significant association between the season and the prevalence rate of endoparasitic helminths in domestic and wild pigeons ($\chi 2 = 13.43$, df = 3, p = 0.004). The prevalence rates of endoparasitic helminths in domestic pigeons were significantly higher in the rainy season (41.6%) compared to the dry season (16.6%) ($\chi 2 = 7.11$, df = 1, p = 0.008). However, no significant difference was observed in the prevalence rates of endoparasitic helminths in wild pigeons between the dry and rainy seasons ($\chi 2 = 2.45$, df = 1, p = 0.118).

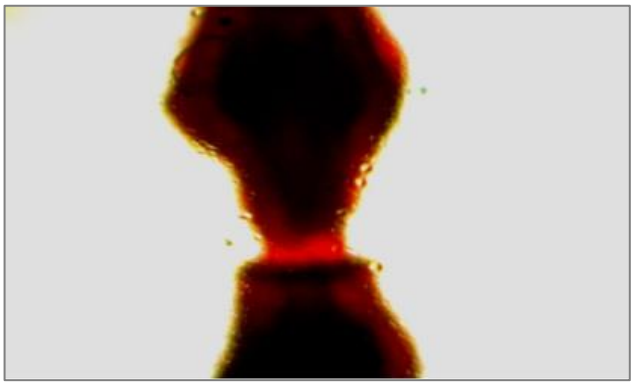

Figure 2: Anterior end view of *Colliobothrium verticillatum*

Table 4 shows significant sex-wise variations in endoparasitic helminth prevalence. Domestic males (33.3%) had higher rates than domestic females (25%), wild males (16.6%), and wild females (8.3%). Chi-squared analysis revealed significant differences between domestic males/females (p=0.04, x2=4.41) and domestic/wild pigeons (p=0.001, x2=13.57), indicating host and sex-specific susceptibility. Chi-square test revealed no significant association between sex and the prevalence rate of endoparasitic helminths in domestic ($\chi 2 = 2.53$, df = 1, p = 0.112) and wild pigeons ($\chi 2 = 1.83$, df = 1, p = 0.176). The prevalence rates of endoparasitic helminths in male and female pigeons were not significantly different in both domestic and wild pigeons.

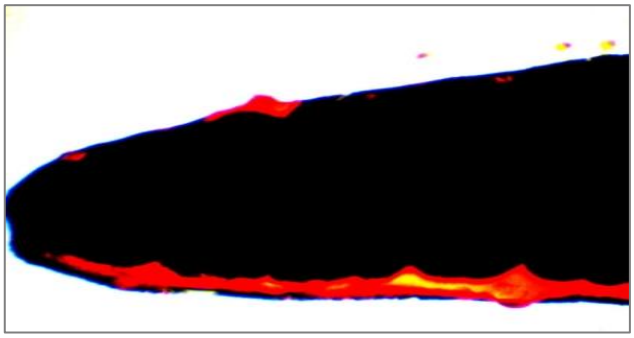

Figure 3: Anterior end view of *Bothriocephalus acheilognathi*

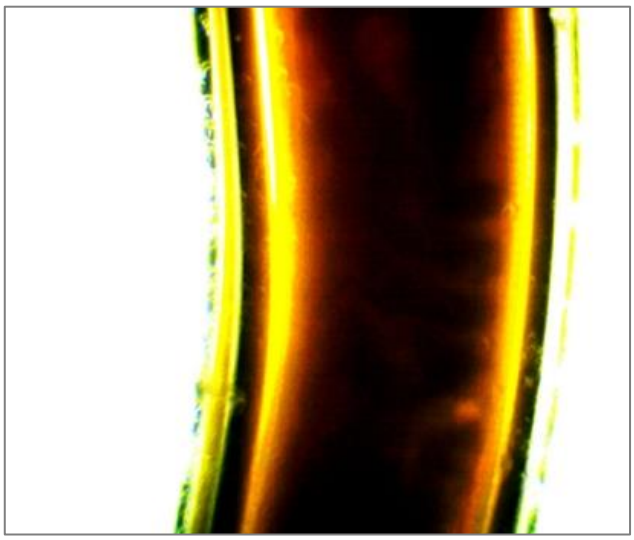

Figure 4: Mid body view of *Trichuris gallinae*

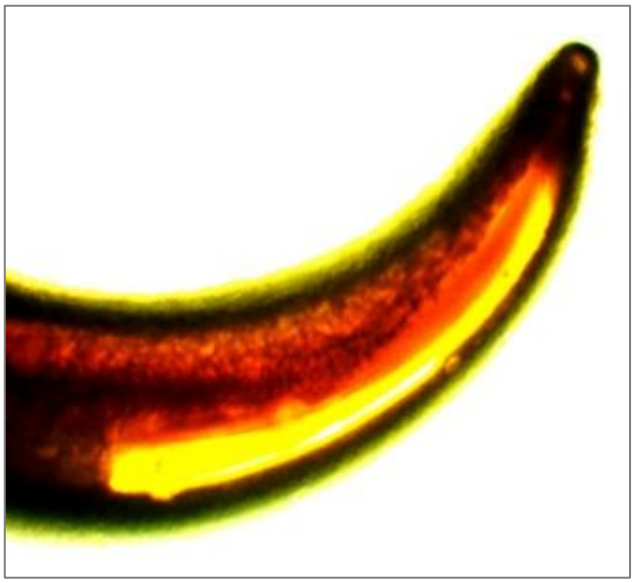

Figure 5: Posterior end view of *Subulura brumpti*

Table 5 presents significant differences in parasite prevalence between domestic (73.4%) and wild pigeon (41.4%), indicating higher parasite diversity and health risks in domestic populations. *Tetragona rallietina* dominated domestic pigeons (58.3%), while *Calliobothrium*

verticillatum prevailed in wild pigeons (27.7%). *Subulura brumpti* (41.6%) predominated domestic pigeons, with *a similar prevalence of spirurid nematodes in both domestic (18%) and wild (13.8%) birds.* The differences are statistically significant ($p < 0.001$, $x2=19.75$), with domestic pigeons 3.5 times more likely to harbor parasites, highlighting ecological adaptations and health implications for the pigeons' population. A chi-square test was performed to compare the prevalence rates between domestic and wild pigeons.

- Chi-Square Value: 23.51
- Degrees of Freedom: 1
- p-Value: < 0.001

Table 6 presents the prevalence of endoparasitic helminths, which varies significantly across the Kano State metropolis. The study revealed that Dala Local Government Area had the highest prevalence rate of 69.4%, while Nassarawa had the lowest at 5.5%. *Trichuris gallinae* and D. noctuae were the most prevalent parasites, occurring in 30 and 24 infections, respectively. Controversy, *B. acheilognatha,* and *C. verticillatum* were the least common parasites, with 13 infections each. A chi-square test was performed to compare the prevalence rates across LGAs.

- Chi-Square Value: 53.11
- Degrees of Freedom: 8
- p-Value: < 0.001

The p-value (< 0.001) is less than the significance level (0.05), indicating a statistically significant difference in the prevalence rates across LGAs.

Table 7 reveals significant variations in endoparasitic helminth prevalence among wild pigeons across the Kano state metropolis. The prevalence rates ranged from 0% (Fagge, Municipal, Tarauni, and Nassarawa) to 27.7% (Kumbotso). C. *verticillatum* and *T. gallinae* predominated, accounting for 40 and 3 infections, respectively. A chi-square test was performed to compare the prevalence rates across LGAs.

- Chi-Square Value: 23.19
- Degrees of Freedom: 8
- p-Value: 0.003

The p-value (0.003) is less than the significance level (0.05), indicating a statistically significant difference in the prevalence rates across LGAs.

Table 8 presents that the prevalence of endoparasitic helminths in domestic and wild pigeons varies significantly across local governments in Kano State metropolis. Notably, dala recorded the highest combined prevalence rate (33.3%), indicating a higher burden of parasitic infections in this area. In contrast, Nassarawa reported the lowest prevalence rate (5.6%). The domestic pigeon population exhibited higher infection rates compared to wild pigeons in most local governments, with Ungogo being an exception. Local governments, such as Fagge, Municipal, and Gwale, displayed similar prevalence rates (22.2% and 16.7%, respectively), while Tarauni and Kumbotso demonstrated distinct patterns. The total sample size for both domestic and wild pigeons is 72 each. The total number of infected domestic pigeons is 21, while the total number of infected wild pigeons is 9. The combined prevalence rate is 30 (20.8%).

Table 1: Prevalence of infection in domestic and wild pigeons

Type of pigeon	Total number examined	Number infected (% of infection)
Domestic pigeon	72	21 (29.1%)
Wild pigeon	72	9 (12.5%)
Total	144	30(20.8%)
Statistical Analysis		
Prevalence: Domestic (29.17%), Wild (12.5%), Combined (20.83%)		
Infection Ratio: Domestic: Wild = 2.33:1		
Inferential Statistics		
Chi-Square Test: Comparing infection rates between domestic and wild pigeons.		
1. $\chi = 8.142$		
2. p-value= 0.0043 (<0.05, significant)		
3. Odds Ratio (OR): 2.83 (95% CI: 1.36-5.89)		

Table 2: the distribution of endoparasitic helminth

Parasites type	Domestic pigeon (n=150)	Wild pigeon (n=53)	Total (n=203)
Cestode	97(64.7%)	34 (64.2%)	131(64.5%)
Nematodes	53 (35.3%)	19 (35.8%)	72 (35.5%)
Total	150	53	203

n= total sample size

Table 3. Seasonal variations in the percentage occurrence of helminth infection in domestic and wild pigeons in Kano metropolis

Host	Season	Number Examined	Number Infected	P.R
Domestic pigeon	Dry	36	6	16.6%
Domestic Pigeon	Rainy	36	15	41.6%
Wild Pigeon	Dry	36	2	5.5%
Wild Pigeon	Rainy	36	7	19.4%

Table 4. Sex wise prevalence

Host	Sex	Number examined	Number Infected	Prevalence percent(%)
Domestic	Male	36	12	33.3%
Domestic	Female	36	9	25.0%
Wild	Male	36	6	16.6%
Wild	Female	36	3	8.3%

Table 5. Parasite diversity and prevalence in domestic and wild pigeon populations.

Type	Species of Parasites	Domestic Pigeons (%)	Wild Pigeons (%)
Cestodes	*Diphylidium noctuae*	25 (34.7)	6 (8.3)
	Taenia pisciformis	10 (13.8)	–
	Tetragona rallietina	42 (58.3)	8 (11.1)
	Bothriocephalus acheilognatha	11 (15.2)	–
	Calliobothrium verticillatum	9 (12.5)	20 (27.7)
Nematodes	Spirurid nematode	13 (18.0)	10 (13.8)
	Subulura brumpti	30 (41.6)	3 (4.1)
	Trichuris gallinae	10 (3.8)	6 (8.3)
Total Infected		**150 (73.5)**	

DISCUSSION

The high prevalence of endoparasitic helminths in domestic and wild pigeons in Kano State Metropolis, Nigeria, is a cause for concern. The most common helminth parasites found in domestic pigeons were *Trichuris gallinae* (41.7%) and *Diphylidium noctuae* (33.3%). Similar to this, Calliobothrium verticillatum (77.8%) and Diphylidium noctuae (11.1%) were the most prevalent helminth parasites among wild pigeons.

The high prevalence of *Diphylidium noctuae* in domestic pigeons is consistent with previous studies (Aboelhadid *et al.,* 2015; El-Shahawy *et al.,* 2016). *Diphylidium noctuae* is a common parasite of pigeons and other birds, and its high prevalence in domestic pigeons may be attributed to poor sanitation, inadequate feeding practices, and lack of veterinary care (Khan *et al.,* 2018). A variety of clinical symptoms, such as diarrhea, weight loss, and fatigue, can be brought on by the parasite, which is usually spread by consuming tainted food and water (Taylor et al., 2016).

The high prevalence of Calliobothrium verticillatum in wild pigeons is consistent with previous studies (El-Shahawy *et al.,* 2016; Khan *et al.,* 2018). *Calliobothrium verticillatum* is a common parasite of wild birds, and its high prevalence in wild pigeons may be attributed to the Consumption of infected food and water is the usual way that the parasite is spread (Khan et al., 2018). The parasite can produce a variety of clinical symptoms, such as diarrhea, fatigue, and weight loss (Taylor et al., 2016).

Due to variations in environmental factors like climate, vegetation, and sanitation, which can impact the distribution and prevalence of helminth parasites, the study also found notable differences in the prevalence rates of helminth parasites across various Local Government Areas in Kano State Metropolis (Aboelhadid et al., 2015).

The present study highlights the significance of parasitological surveillance along with control steps to limit the spread of helminth parasites in pigeons and other birds in Kano State Metropolis.

The study also emphasizes the need for improved sanitation, adequate feeding practices, and regular veterinary care to reduce the prevalence of helminth parasites in domestic and wild pigeons.

To sum up, the current study has demonstrated a higher frequency of endoparasitic helminths in domestic compared to wild pigeons in Kano State Metropolis, Nigeria. The study has also shown that *Trichuris gallinae* and *Diphylidium noctuae* are the most common helminth parasites found in domestic pigeons, while *Calliobothrium verticillatum* and *Diphylidium noctuae* are the most common helminth parasites found in wild pigeons (Aboelhadid *et al.,* 2015; Ali *et al.*, 2017; El-Shahawy *et al.,* 2016).

The high prevalence of endoparasitic helminths in pigeons in Kano State Metropolis is a cause for concern, as these parasites can cause significant morbidity and mortality in birds (Khan *et al.,* 2018). Furthermore, some of these parasites, such as *Trichuris gallinae*, can also infect humans and other animals, posing a significant public health risk (Rehman *et al.*, 2018).

Table 6. **The overall prevalence of endoparasitic helminths in domestic pigeons in Kano State metropolis**

S/N	LGA	N	*D. noctuae*	*T. pisciformis*	*T. rallietina*	*B. acheilognatha*	*C. verticillatum*	Spirurid nematode	*S. brumpti*	*T. gallinae*	Prevalence (%)
1	Dala	9	15	4	16	2	3	2	4	4	50 (69.4)
2	Fagge	9	4	–	6	3	5	4	8	3	32 (44.4)
3	Municipal	9	2	3	4	2	1	–	2	–	14 (19.4)
4	Tarauni	9	1	3	2	–	–	4	6	3	18 (25.0)
5	Ungoggo	9	1	–	5	–	–	2	–	–	8 (11.0)
6	Kumbotso	9	–	–	3	–	–	1	4	–	8 (11.0)
7	Nassarawa	9	2	–	2	–	–	–	–	–	4 (5.5)
8	Gwale	9	–	–	4	4	–	–	6	–	14 (19.0)
	Total	**72**	**25**	**10**	**42**	**11**	**9**	**13**	**30**	**10**	
	NI		2	1	7	3	1	2	4	1	21 (29.1)

LGA: Local Government Area; N: No. of Samples; NI: Not Infected

Table 7. **Overall prevalence of endoparasitic helminths in wild pigeons in Kano state metropolis**

S/N	LGA	N	*D. noctuae*	*T. pisciformis*	*T. rallietina*	*B. acheilognatha*	*C. verticillatum*	Spirurid Nematode	*S. brumpti*	*T. gallinae*	Prevalence (%)
1	Dala	9	–	–	2	–	6	–	–	–	8 (11.1)
2	Fagge	9	–	–	–	–	–	–	–	–	–
3	Municipal	9	–	–	–	–	–	–	–	–	–
4	Tarauni	9	2	–	4	–	–	–	3	–	9 (12.5)
5	Ungoggo	9	–	–	–	–	–	6	–	4	10 (13.8)
6	Kumbotso	9	4	–	–	–	10	4	–	2	20 (27.7)
7	Nassarawa	9	–	–	–	–	–	–	–	–	–
8	Gwale	9	–	–	4	–	4	–	–	–	8 (11.1)
	Total	**72**	**6**	–	**10**	**0**	**20**	**10**	**3**	**6**	**55 (76.3)**
	NI		1	–	1	–	3	2	1	1	**9 (12.5)**

LGA: Local Government Area; N: No. of Samples; NI: Not Infected

Table 8. Comparative prevalence of endoparasitic helminths in domestic and wild pigeons across local governments in Kano State metropolitan.

Local government	Domestic examined	Domestic infected	Wild pigeon examined	Wild pigeon infected	Combined prevalence (%)
Dala	9	5	9	1	6(33.3)
Fagge	9	4	9	0	4(22.2)
Munincipal	9	4	9	0	4(22.2)
Tarauni	9	2	9	1	3(16.7)
Ungoggo	9	2	9	2	4(22.2)
Kumbotso	9	1	9	4	5(27.8)
Nassarawa	9	1	9	0	1(5.6)
Gwale	9	2	9	1	3(16.7)
Total	72	21	72	9	30(20.8)

Therefore, it is recommended that pigeon owners and breeders in Kano State Metropolis take measures to control the spread of endoparasitic helminths in their birds. These measures may include regular deworming, improved sanitation, and adequate feeding practices (Khan *et al*., 2018). Additionally, public health education campaigns should be implemented to raise awareness about the risks associated with endoparasitic helminths in pigeons and other birds.

Due to variations in environmental factors like climate, vegetation, and sanitation, which can impact the distribution and prevalence of helminth parasites, the study also found notable differences in the prevalence rates of helminth parasites across various Local Government Areas in Kano State Metropolis (Aboelhadid et al., 2015).

CONCLUSION

The present study highlights the significance of parasitological surveillance along with control steps to limit the spread of helminth parasites in pigeons and other birds in Kano State Metropolis.

The study also emphasizes the need for improved sanitation, adequate feeding practices, and regular veterinary care to reduce the prevalence of helminth parasites in domestic and wild pigeons.

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