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Research Article Detection of *Capillaria obsignata* of Pigeons (*Columba livia domestica*) from Kano State, Nigeria

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Abstract

Background and Objective: *Capillaria* species (hairworm), a parasitic nematode is well known to cause severe illness in pigeons thereby limiting their productive performances. A number of studies have been conducted on nematodes of domestic pigeons in some parts of Nigeria. However, information on the capillariasis of pigeons in Kano state is scanty. This study was therefore conducted to investigate the prevalence of *Capillaria* species among locally domesticated pigeons (*Columba livia domestica*) in Kano State, Nigeria. **Methodology:** Intestinal contents from 144 pigeons were examined for the period of six months; dry (February-April) and wet (June-August) seasons in 2007. Pigeons were grouped according to squabs (chicks) (0-4 weeks), squeakers (Juveniles) (5-8 weeks) and Youngsters (Adults) (9 weeks onwards). *Capillaria* nematodes were retrieved, counted and stained and mounted in balsam. Differences in the prevalence of infection between the pigeons examined based on their sexes and seasons were analyzed statistically using the students' t-test. **Results:** Prevalence of 11 (7.63%) was revealed for Capillariid nematodes and egg. Infection rate was higher in males 7 (9.72%) than females 4 (5.55%) pigeons. There were no significant sex related differences seen in the prevalence of *C. obsignata* (p<0.05). Among the pigeons examined only the youngsters were found to be infected. **Conclusion:** This study demonstrated the prevalence of *Capillaria* not state. This has an implication on the sustainable pigeon production and adequate supply of human protein requirement will therefore be ensured.

Key words: Capillaria obsignata, Columba livia domestica, pigeons, prevalence, squabs, squeakers, youngsters

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Domestic pigeons (Columba livia domestica Gmelin 1789) are raised as a source of protein (low in fat and cholesterol), manure (organic fertilizer), feather products and as a source of income to local breeders in Kano Central Metropolis¹. Several studies have also shown that pigeons are often used as pets and for religious, social, ceremonial, ritual purposes²⁻⁴. In Kano, pigeons are typically bred as either semi-intensive or free range whilst scavenging and foraging on invertebrates such as termites, earthworms and Polyxenus spp., ants around homesteads. These breeding systems therefore predispose the birds to infective stages of a plethora of gastro-intestinal parasites and inherent zoonosis⁵⁻⁷. The pathological implication of helminthic parasites is typically the most important limiting factor of productivity and general wellbeing of domestic pigeons⁸. Several helminthic parasites often inhibit the intestine of the infested pigeons, where there is an abundance of absorbable nutrients and shelter. Heavy infestation with these parasites therefore causes mechanical damages to the intestinal linings of pigeons thereby leading to a compromise in the metabolic and growth processes resulting in toxic effects9. Previous studies revealed that heavy infection of these parasites in pigeons including capillariasis caused by Capillaria¹⁰ are often associated with chronic gastro-enteritis, anorexia leading to severe emaciation and ultimately death¹¹. Sustainable pigeon production is known to be limited due to parasitism often caused by nematodes such as Ascaridia columbae (Round worm), *Capillaria* spp. (Hairworm) and *Dispharynx* spp.¹². Adequate epidemiological understanding of these parasites is quintessential in the design of effective control strategies of the parasites in pigeons. Several studies have reported high prevalence of capillariasis of pigeons from different areas of the world including Nigeria¹¹⁻¹⁹. Investigations in Maiduguri, North Eastern Nigeria showed a relatively higher prevalence of Capillaria obsignata in domestic pigeons. Additionally, Capillaria caudinflata was also observed in the study area⁹. In the neighboring Zaria, Kaduna State, North Western Nigeria though a lower prevalence of a different species Capillaria anatis were reported¹⁹. However, there is no information on the prevalence of capillariasis in Kano. This preliminary study therefore was conducted to investigate the prevalence of capillariasis in some selected Local Government Areas of Kano state, Nigeria.

MATERIALS AND METHODS

Description of the study area: Kano State lies in the Sudan savannah zone of Nigeria (Latitude: 12°12'N and long: 8°3'E).

It has at its North and Eastern borders Plateau, Bauchi and Katsina states respectively. The climate is the Sudan type, with a mean temperature of 25 °C. The rainy season is from May to October, with an annual rainfall of 1000 cm^{3 1}. The study was conducted in 12 Central Local Government Areas of Kano state, namely; Dala, Dawakin kudu, Fagge, Gezawa, Gwale, Kumbotso, Minjibir, Municipal, Nassarawa, Tarauni, Tofa and Ungogo.

Study population: A total of 144 pigeons comprising 72 males and 72 females were sampled during the period of the study, covering both dry (February-April, 2007) and wet (June-August, 2007) seasons respectively. Pigeons were grouped according to squabs (chicks) (0-4 weeks), squeakers (Juveniles) (5-8 weeks) and Youngsters (Adults) 9 weeks onwards⁵.

Samples collection: The intestinal contents of slaughtered pigeons purchased from 12 selected Local Government Areas of Kano State were examined in the Faculty of Science laboratory, Bayero University, Kano, Nigeria for the presence of *Capillaria* nematodes and eggs.

Preparation of samples: The birds were humanely slaughtered, dissected and necropsied in the laboratory to expose the intestines as described by Fatihu *et al.*²⁰. The last portion of the intestinal tract was severed and placed in a petri dish containing 0.85% Physiological Saline Solutions (PSS). The intestinal mucosa were scraped using microscopic slides whilst the nematodes were collected using a fine brush and were fixed in hot A.F.A (Alcohol 70°GL, 93 mL, formaldehyde 5 mL, acetic acid, 2 mL). The Capillaria nematodes were retrieved, counted and stained using alcoholic chloride carmine, dehydrated in a serial dilution of ethanol (70-100%), cleared in phenol and mounted in balsam. Identification of the parasite was microscopically carried out using dissecting stereoscope as described by Mohammed⁵. The remaining mucosal scrapings were examined using the floatation technique of saturated sodium chloride solution to identify the capillariid ova at X40 magnification. Capillariid eggs were identified based on their sizes measured using a mechanical vernier caliper and morphology. The date of collection, sex and age of birds as well as sites of collection were recorded as described by Greenberg et al.²¹.

Data analysis: Differences in the prevalence of infection between the pigeons examined based on their sex and seasons were analyzed statistically using the students' t-test. Significant difference was accepted at $p<0.05^{22}$.

RESULTS

This study have shown that, of the 144 pigeons examined, 11 (22.91%) were infected with *Capillaria obsignata* (*Capillaria columbae*). The total prevalence across the Local Government Areas was 7.63% with Kumbotso having the highest prevalence of 3 (2.78%), Dawakin kudu and Tarauni having the lowest prevalence of 1 (0.69%). The severity of infection was higher in Dala and Kumbotso while Tarauni has the lowest (Table 1).

Table 1: Prevalence and severity of infection of *Capillaria obsignata* identified from the infected pigeons in the selected local government areas of Kano State

Local	Number	Intensity of	Number	Prevalence
government area	sampled	infection	infected	(%)
Dala	12	+++	3	2.01
Dawakin kudu	12	++	1	0.69
Fagge	12	-	-	-
Gezawa	12	-	-	-
Gwale	12	-	-	-
Kumbotso	12	+++	4	2.78
Minjibir	12	-	-	-
Municipal	12	-	-	-
Nassarawa	12	-	-	-
Tarauni	12	+	1	0.69
Tofa	12	++	2	1.39
Ungogo	12	-	-	-
Total	144		11	(7.63)

+: Mild, ++: Moderate, +++: Severe

Table 2: Sex related distribution of Capillaria obsignata in the sampled pigeons

	Total no. of	Number	Prevalence
	examined	positive	(%)
Sex			
Male	72	7	9.72
Female	72	4	5.55
Age			
Squabs (0-4 weeks)	48	-	-
Squeakers (5-8 weeks)	48	-	-
Youngsters (9 weeks +)	48	11	22.91
Total no. of examined	144		



Fig. 1: Distribution of *Capillaria obsignata* infection in the sampled pigeons during the dry and wet seasons

The study also revealed that there was no statistical difference between the sexes (p<0.05) whilst only the youngsters were infected with parasite and no infection was recorded for both squabs and squeakers (Table 2).

The infection of pigeons with *C. obsignata* was higher during the rainy season than dry season (p<0.05) (Fig. 1).

DISCUSSION

The domesticated pigeons (Columba livia domestica) used for this study in Kano state were typically raised on either semi-intensive or free range, with access to the floor, thereby predisposing them to Capillaria infection. The relatively high prevalence of 7.11% of Capillaria obsignata therefore could be attributed to high mean temperature and Relative Humidity (RH), which lower the resistance of birds and favor heavy infection⁷. The prevalence in this study agrees with the study of Alam et al.⁶ in Borno state (9%), 5% in Taraba state¹⁶ and 6% in Iran²³. However, lower rate of infection with Capillaria spp., 1(0.72%) was recorded in Kaduna state, 0.8%¹⁹, Iran (0.72%)²⁴, India, 0.27%²⁵ and in Beni-Suef province, Egypt, 2 (0.27%)²⁶. Capillaria obsignata infections were higher during the dry season compared with wet season. This concurs with the findings of El-Dakhlya et al.²⁶ in Egypt and Parsani *et al.*⁷ in India.

Further investigations also revealed that infection rate was higher in males 7 (9.72%) than females 4 (5.55%) (p<0.05) is similar to what was obtained in Taraba state¹⁸. This could be attributed to various behavioral and morphological variations resulting in infection proneness amongst the two sexes²⁷. However, the statistically non-significant difference might be due to close association of the male and female pigeons for both feed and flight, accordingly proportionate possibility of getting infection of *C. obsignata* from the environment. In this study, infection occurred only in youngsters, which could be due to the presence of infective stages of intermediate hosts and age related factors thereby predisposing them to act as carriers and an important source of infection for other poultry hosts⁷. Moreover, poor drainage and ventilation inside pigeon lofts and feeding on the floor are also often associated with capillariasis and therefore control heavily relies on general hygiene⁵.

CONCLUSION

The findings of the present study concluded that the gastrointestinal nematode *C. obsignata* is prevalent in domestic pigeons in Kano Central Metropolis. This study also

demonstrated that infection of pigeons with these parasites could reduce the quality and quantity of meat produced, thereby reducing sustainable pigeon production and consequently protein supply for human consumption. It was further observed that poor management practices and inadequate health care were attributed to this parasitic infection. This study will help on the need for proper management practices including effective regular deworming be employed to improve the health status of pigeons in the study area.

SIGNIFICANCE STATEMENTS

Domestic pigeons are an important source of human protein in Kano State and also serve as a source of income to the local pigeon breeders. They are however adversely affected by infection with *Capillaria* spp., an intestinal helminth parasite. However, pigeons are not often accorded the required veterinary surveillance. The study will therefore assist pigeon breeders in the study area of designing control strategies and effective veterinary surveillance. Hence, an appropriate enlightenment is required on the maintenance of good hygiene in pigeon lofts and the provision of adequate feed supplements to pigeons by the local breeders.

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