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Study of the Intestinal Protozoan in some Local Chickens (Gallus domesticus) and Pigeons (Columba livia domesticus) in Misurata, Libya

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Abstract

Parasitic diseases rank among the primary limitations to poultry production. Among the intestinal protozoan infections, particularly those caused by *Eimeria* species and *Entamoeba* spp. are frequently encountered in domestic fowl. This study investigated the prevalence and morphological characteristics of intestinal protozoan parasites in local chickens (*Gallus domesticus*) and domesticated pigeons (*Columba livia*). A total of 151 birds were examined, consisting of 100 local chickens and 51 pigeons, which were collected from various random markets in Misurata. A total of 64 birds (42.4%) were infected. The prevalence of infection was significantly higher in local chickens (51, 79.7%) than in domesticated pigeons (13, 20.3%). The protozoan species differed between local chickens and pigeons. In local chickens, *Entamoeba* cysts (70.6%) were the most common infection, followed by coccidian oocysts at 29.4%. In pigeons, coccidian oocysts (77%) were more prevalent than *Entamoeba* cysts (23%). By sex, there were significant differences in infection rates ($P \leq 0.05$) among local chickens; males had higher infection rates for *Entamoeba* cysts (61.8%) than females (26.3%). The prevalence of coccidian oocysts was 73.7% in females and 38.5% in males. Otherwise, in pigeons, females showed greater susceptibility to both coccidian oocysts and *Entamoeba* cysts (85.7% and 63.7%, respectively) than males (14.3% and 33.3%), respectively. Based on these findings, the study concludes that implementing an integrated parasitic control programme for local chickens and pigeons is essential.

***Keywords*:** *Protozoa Infections, Gallus Domesticus, Columba Livia Domesticus, Intestinal Infections.*

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I. INTRODUCTION

Local chickens and pigeons consume a diverse diet that includes slugs, earthworms, grains, and insects. Many of these food items can carry the infectious stages of parasitic protozoa. Several intestinal protozoa have been associated with causing illness and death in domestic birds (Adang *et al*., 2008).

In developing countries, poultry production is vital for global food security as it provides essential animal protein. Many farmers use free-range systems for raising chickens and rely on domesticated pigeons for their nutritional needs (Attia *et al*., 2022; Hafez and Attia, 2020). However, intestinal protozoan parasites, such as coccidia and Entamoeba, pose a significant threat to the health of birds. These parasites are spread through

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the fecal-oral route, often via contaminated feed, water, or litter. Once ingested, they damage the intestinal wall, resulting in symptoms such as enteric distress, slow growth, decreased egg production, and, in many domestic flocks, even death (Blake, 2025; Gómez-Osorio *et al*., 2024).

Several studies have documented the presence of intestinal protozoa in chickens and pigeons that are locally infected. These domestic birds may serve as potential reservoirs of intestinal coccidian, increasing the risk of cross-species transmission in environments shared by different bird species (He *et al*., 2024).

The prevalence of local chickens infected with coccidian oocysts from the Eimeria genus exceeds 70%, making it the most common protozoan infection in Nigeria (Lawal *et al*., 2016). Among the *Eimeria* species, *Eimeria tenella* and *Eimeria necatrix* are the most prevalent and pathogenic. These high prevalence rates are linked to risk factors such as inadequate sanitation and high humidity (Györke *et al*., 2013). *Eimeria labbeana* is recognised as the most prevalent and infectious coccidian species in pigeons. Research on this parasite in Libya is still limited. Al-Agouri *et al*. (2021) reported a 72% infection rate with coccidian parasites in pigeons from Benghazi. Other studies include those by Alkharigy *et al*. (2018) in Tripoli and Eljadar *et al*. (2012) in Eljabl Elkhadar. Internationally, Khan *et al*. (2006) documented a high prevalence of *E. labbeana* in domestic pigeons in Pakistan, which highlights the widespread nature of this infection.

Martínez-Díaz *et al*. (2000) reported the presence of cysts of *Entamoeba gallinarum*, a non-pathogenic intestinal protozoan found in domestic chickens, only in cases of co-infections with other intestinal protozoa. In contrast, pigeons exhibit some differences, as they can host more pathogenic species, such as *E. invadens*, which is associated with a high mortality rate in these birds (Curtis and Chiodini, 2010).

The current study aimed to investigate the prevalence of coccidian oocysts and *Entamoeba* cysts in local chickens (*Gallus domesticus*) and domestic pigeons (*Columba livia*) in the Misurata region of Libya.

II. Materials And Methods

A. Studey area

The current study took place in Misurata, a city in northwestern Libya, from January to June 2022. This region is located at a geographic coordinate of latitude 32°22′39.12″N and longitude 15°05′31.26″E, according to the world map. 151 domestic birds were collected, comprising 51 pigeons (*Columba livia*) and 100 local chickens (*Gallus domesticus*). These birds were sourced from various locations within local markets.

B. Sample collection and examination

After euthanasia, the pigeons and local chickens were dissected in accordance with established protocols (Fowler, 1996). The digestive tract was removed carefully and then divided into different sections: the oesophagus, proventriculus, gizzard, duodenum, jejunum, ileum, ceca, and rectum. Each section was placed in a Petri dish filled with 0.9% physiological saline, and the contents were rinsed through a 100-µm test sieve. Finally, a drop of the sample was taken and placed on a clean slide, then examined under a 40X microscope to identify intestinal protozoa. The sample was preserved in 70% ethanol for further identification (Soulsby, 1982).

C. Statistical analysis

Data obtained from the prevalence study were analysed using descriptive statistics, and the results were summarized as percentages. A Student's t-test and correlation analysis were employed to examine the differences in the prevalence of parasitic species. Variations in the prevalence of intestinal protozoa in relation to sex were assessed using the t-test. All statistical analyses were conducted using SPSS software.

III. Results

A. Prevalence of intestinal protozoa infections in local chickens and pigeons

Intestinal protozoan cysts were found in 42.4% of the examined birds, with 64 out of 151 showing signs of infection. The infection rate was significantly higher among local chickens, which accounted for 51 cases, or 79.7% of all infections, compared to pigeons, which reported 13 cases, representing 20.3% (Table 1), with significant differences (P≤.0.01). A distinct difference in infection patterns was noted between the two species. Local chickens displayed a higher prevalence of *Entamoeba* cysts with a rate of 36 (70.6%), while the prevalence of coccidian oocysts in chickens was 15 (29.4%). In contrast, pigeons were more frequently infected with coccidian oocysts, showing a rate of 10 (77%), compared to 3 (23%) for *Entamoeba* cysts. The statistical analysis only showed the significant differences between *Endameba* cysts and coccidian oocysts in pigeons (P≤ 0.01) (Table 2). Additionally, mixed infections were more common in chickens 35 (68.6%), whereas single infections with coccidian 09 (69.2%) predominated in pigeons, with significant differences (P≤.0.01) (Table 3).

Table 1. The prevalence and distribution of intestinal protozoan parasites in examined local chickens (*Gallus domesticus*) and domesticated pigeons (*Columba livia*).

	Examined No.	Infected No.	%
Local chickens	100	51	(79.7%)
Pigeons	51	13	(20.3%)
Total infection	151	64	(42.4%)
P value	**	**	**

** Highly significant difference.

Table 2. A comparison of the prevalence of *Entamoeba* cysts and coccidian oocysts in local chickens and domesticated pigeons.

	Entamoeba cysts	Coccidian oocysts	P value
Local chickens	36 (70.6%)	15 (29.4%)	NS
Pigeons	03 (23%)	10 (77%)	**
Total infection	39 (60.9%)	25 (39.1%)	NS

** Highly significant difference.

Table 3. Prevalence rate of *Entamoeba* cysts and Coccidian oocysts from domestic local chickens and domestic Pigeons.

	Local chickens	Pigeons	Total infection
Single infection	17 (33.3%)	9 (69.2%)	26 (40.6%)
Mixed-infection	34 (66.7%)	4 (30.8%)	38 (59.4%)
P value	NS	**	*

* Significant difference at (0.05), ** Highly significant difference at (0.01)

The overall prevalence of intestinal protozoan infections varied significantly between the two bird species. In local chickens, protozoan cysts were found in 13 (25%) of males and 38 (75%) of females, indicating a notably higher infection rate in females ($P \leq 0.01$). Conversely, pigeons showed the opposite pattern, with females having a higher, though not statistically significant, prevalence compared to males ($P > 0.01$) (Table 4).

Table 4. Prevalence and distribution of intestinal protozoan parasites in relation to host sex in local chickens (*Gallus domesticus*) and domestic Pigeons (*Columba livia*).

	Sex	Infected No.	Prevalence rate %	P value
Local chickens	Male	13	25%	0.001
	Female	38	75%	
Pigeons	Male	6	46.2%	0.18
	Female	7	53.8%	

Statistical analysis was performed using the Chi-square test with Yates' correction. P-value <0.01 indicates a statistically significant difference.

Analysis by parasite types revealed further significant gender-related differences. In local chickens, males exhibited higher infection rates for both *Entamoeba* cysts (61.5%) and coccidian oocysts (38.5%), with statistically significant differences ($P \leq 0.01$). In contrast, in pigeons, females and males demonstrated higher prevalence of coccidian oocysts (85.7%, 66.7%), respectively, with these differences also reaching statistical significance ($P \leq 0.01$) (Table 5).

Table 5. Prevalence of *Entamoeba* cysts and coccidian oocysts by sex in local chickens (*Gallus domesticus*) and domestic pigeons (*Columba livia domestica*).

	Sex	*Entamoeba* cysts	Coccidian oocysts	P value
Local chickens	Male	8 (61.5%)	5 (38.5%)	0.000
	Female	10 (26.3%)	28 (73.7%)	
Pigeons	Male	2 (33.3%)	4 (66.7%)	0.01
	Female	1 (14.3%)	6 (85.7%)	

B. Morphological characterisation of intestinal protozoan parasites in local chickens (Gallus gallus domesticus) and domestic pigeons (Columba livia domestica)

Morphological characterisation of intestinal protozoan parasites in local chickens (*Gallus gallus domesticus*) and domestic pigeons (*Columba livia domestica*).

Microscopic examination revealed distinct morphological features among the identified protozoan parasites. The cysts of *Entamoeba* spp. measured between 8 and 25 µm in diameter, with a range of (19.2-20.5 µm) and contained one to more than four nuclei. The chromatoid bodies were typically rod-shaped with rounded ends, as illustrated in Figures 1 and 2.

Figure 1. Morphology of *Entamoeba* cysts in *Gallus domesticus,* 40X.

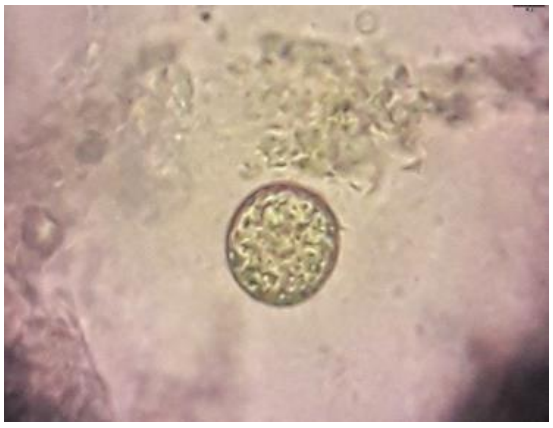

Figure 2. Morphology of *Entamoeba* cysts found in domestic pigeons (*Columba livia domestica*), 40X.

In contrast, coccidian oocysts from *Eimeria* species found in chickens were ovoid, measuring between 15.2 and 22.8 µm by 12.5 to 18.6 µm, and featured double-layered walls, as illustrated in Figure 3.

Figure 3. Morphology of coccidian oocysts in local chickens (*Gallus domesticus*), 40X.

Coccidia derived from pigeons displayed spherical to subspherical oocysts measuring 18.5 to 24.3 µm, characterized by prominent micropyles, as illustrated in Figure 4.

Figure 4. Morphology of coccidian oocysts in domestic pigeons (*Columba livia domestica*), 40X.

IV. Discussion

Local chickens and domestic pigeons kept under intensive management should have an extremely low parasite tolerance with proper hygiene and good management. However, high parasitic infections may therefore indicate poor management and control. Globally, domestic fowl are recognised as carriers of various pathogens, including intestinal protozoa, which are commonly diagnosed in many of these birds. Some species of coccidia found in them may also pose zoonotic risks (Atsineka and Banke, 2006). The study results indicate that intestinal protozoan infections are prevalent in local chickens (79.7%), while only 20.3% of pigeons are affected. The high prevalence of intestinal protozoan infections observed in this study may indicate a significant presence of the infective stages of these parasites in areas where local chickens and pigeons are raised. Additionally, the methods of transmission for these parasites are plentiful, allowing for easy infection of the birds as they search for food. Local chickens often peck at the soil, where infective stages accumulate, leading to direct oral transmission of the parasites to the chickens (Jatau *et al*., 2012).

Local chickens with infections showed a mixed infection rate of 66.7%, while the rate for infected pigeons was 30.8%. This result is in line with the study by Agba *et al*. (2024) conducted in Nigeria. The greater prevalence of infection in local chickens compared to pigeons can be linked to overcrowded housing situations and insufficient cleaning methods in the chicken flocks.

Some species of intestinal protozoa were detected in local chickens and pigeons. The identified species comprised *Entamoeba* cysts and coccidian oocysts (Atsineka and Banke, 2006). Among local chickens, *Entamoeba* cysts had the highest prevalence at 70.6%, while coccidian oocysts had the highest infection rate at 77% among infected pigeons. These findings correspond with those reported by Martínez-Díaz *et al*. (2000), which identified *Entamoeba gallinarum* as the most common species in backyard chickens. In Nigeria (Negbenebor and Ali, 2018), Pakistan (Yousaf *et al*., 2018), Egypt (El-Salama *et al*., 2025), and in Elbyda, Libya (Abdalsalam *et al*., 2025), lower prevalence rates of coccidian oocysts were reported than in the current study. In contrast, the results of the current study corresponded with findings from previous research conducted by Khan *et al*. (2006) in Pakistan and Alasadiy *et al*. (2022) in Iraq, both of which identified *Eimeria labbeana* as the most common pathogen affecting these pigeons. Based on the morphological characteristics of coccidian oocysts, the identification of *Eimeria labbeana* in pigeons agreed with the findings of Al-Agouri *et al*. (2021) in Benghazi, Libya. In local chickens and pigeons, females were found to be more infected than males. In local chickens and pigeons, females may have higher infection rates than males due to differences in behaviour. Females often spend more time in areas where pathogens are present. Physiological factors, such as hormonal influences on the immune response, may also play a role. Furthermore, females are typically more involved in nesting and brooding activities, which can increase their exposure to infections. This finding aligns with a study by Al-Agouri *et al*. (2021) conducted in Benghazi, Libya.

V. Conclusions

The study revealed that intestinal protozoa present a significant challenge for free-range pigeons and chickens in Misurata, Libya. Local chickens were found to be more frequently infected with these protozoa than pigeons. Furthermore, female birds exhibited higher infection rates compared to males. These parasites can weaken the birds, increasing their susceptibility to bacterial and viral infections. Thus, regular deworming of both chickens and pigeons, along with improved management practices, is essential for maintaining their health and well-being in this region.

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