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DETECTION OF HAEMOPROTOZOA IN TURKEYS AND CHICKEN

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ABSTRACT

Haemoprotozoa are protozoa parasites that inhabit the blood and tissue of their avian hosts, specifically within their intracellular and extracellular erythrocytes. This study was conducted from October 2021 to March 2022 to identify and diagnose various species of blood parasites infecting chickens and turkeys in Mosul and Erbil. A total of 120 blood samples were collected from local chickens and turkeys. Blood smears were used for diagnostic purposes. After the examination of blood smears, the results showed the overall infection rates were 60% (54 out of 90) in local chickens (*Gallus gallus domesticus*) and approximately 40% (12 out of 30) in turkeys. Notably, chickens had a higher prevalence of infection in males (55.6%), whereas turkeys showed a higher prevalence in females (50%) ($P < 0.05$). Four species of blood protozoa were identified among chickens and turkeys: *Leucocytozoon* spp., *Plasmodium* spp., *Haemoproteus*, spp. Additionally, *Trypanosoma* species were exclusively identified in the blood smears of chickens. These findings highlight a significant prevalence of haemoprotozoa infections in both local chickens and turkeys, indicating potential health risks for poultry populations. It is essential to implement monitoring and control measures to mitigate the impact of these parasites on avian health and productivity. Continued research is crucial for developing effective strategies to manage haemoprotozoa infections in poultry.

Key words: Haemoprotozoa, turkeys, Chickens, *Leucocytozoon* spp., *Plasmodium* spp., *Haemoproteus Trypanosoma* spp.

INTRODUCTION

In addition to being a principal source of proceeds for the country, the poultry business is crucial to the food financing of animal protein (meat and eggs) to humans. One of the domesticated poultry types that is elevated the most vigorous is the chicken, which is also the most progressive and effective animal production industry. Until now a huge difference had been set up between the commercialized and village enterprise subsector of poultry farming in Africa and some regions of Asia, each with their characteristics (Nnadi and George, 2010). However, the majority of commercial

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poultry is produced as chickens and turkeys. Haemosporidia are intracellular protozoan parasites located within the erythrocytes also tissues of their avian hosts. They are widely spread and subsist in an assortment of avian species, together with local chicken and turkey. Various types of bacterial, fungal, viral, and parasitic pathogens can effortlessly infect local poultry (Andreina and Ananias, 2011;). The following genera are the most common hemoparasites discovered in poultry in tropical regions: Plasmodium spp., *Leucytozoon* spp., *Haemoproteus* spp., *Aegytinella* spp., *Trypanosoma* spp., and microfilariasis of worms' relevance to the suborder filariata (Permin and Hanson,1998). There are reports that the majority of poultry hemoparasites have closely linked life cycles (Ogbaie *et al*., 2019). Relying on the species of the protozoa and the tissues impacted, hemoparasitic infection in birds primarily causes anemia, along with a host of other serious diseases. (Dey *et al*., 2008; Naqvi *et al*., 2017; Ogbaie *et al*., 2019). Numerous studies have demonstrated that a variety of vectors, such as biting midges, lice, fleas, black flies, and mosquitoes, aid in the spread of hemoparasites (Dey *et al.*, 2008; Ogbaie *et al.*, 2019). The existence of the protozoa may not lead to significant devision of the haematology of the chickens, but the haematological parameters can only be significantly affected by the severity and pathogenicity of the protozoan implicated (Ogbaie *et al*., 2019). Eggs and meat from birds are vulnerable to protozoal diseases like haemosporidia (Hasson, 2015). Shadan (2013) detected that *Plasmodium* spp. was the most widespread haemoparasites in local chickens in Sulaimani, Iraq 52.63% (70/133).

Numerous researches have declaimed the geographical spreading of genetically obvious blood protozoal in various regions and locations (Chaser *et al*., 2009) .Since the presence of the vector is necessary for successful transmission, infections happen more frequently during the warmer months of the year. The sporozoite, which is found in the salivary glands of the insect vector, is the infectious stage of the parasite (Friend and Franson, 1999; Tayler, 2015; Urquart *et al*., 1996). In account of the important effects of avian haemoparasites on economic damage and mortalities, this study was conducted to diagnose *Leucocytozoon* spp., *Plasmodium* spp., Haemoproteus, *Trypanosoma* spp. in all affected local chickens and turkeys in Mosul and Erbil's city, Iraq.

MATERIAL &METHODS

1-Study area and sample collection

Local strains of domestic poultry (*Gallus gallus domesticus*) were acquired from various regions in Mosul and Erbil cities between October 2021 and March 2022. This included 90 chickens (48 males and 42 females) and 30 turkeys (18 males and 12 females). To collect blood samples, the wing vein of each bird was wiped with 70% ethyl alcohol, and approximately one milliliter of blood was drawn. For each individual sample, two blood smears were prepared to facilitate the morphological identification of hematozoa.

2- Samples Examination

The thin blood smears were prepared and fixed in absolute methanol for 5 minutes. Once the smears were fixed, they were stained using a 10% working solution of Giemsa's stain (Coles and Lea, 1986; Urquart *et al*,1996). The prepared smears were examined under an oil immersion lens to identify blood protozoa. Different species, including *Haemoproteus* and *Leucocytozoon*, were identified. *Plasmodium* infection was confirmed by recognizing the intraerythrocytic schizonts or gametocyte stages of the parasites, while *Trypanosoma* spp. were identified as extracellular parasites (Coles and Lea, 1986; Fatima and Maqboo, 2014; Tayler, 2015).

3-Statistical analysis

Chi-square analysis was performed on the data using the SPSS version to ascertain group differences at ($P<0.05$) (Niazi, 2001).

RESULTS

Microscopic examination revealed that the overall infection rates of haemoprotozoa in local strain domestic poultry and turkeys were 60% (54 out of 90) and 40% (12 out of 30), respectively, with a significance level of $P<0.05$ for both single and double infections. The results identified four types of blood protozoa present among chickens and turkeys: *Leucocytozoon* spp., *Plasmodium* spp., *Haemoproteus*, and identified *Trypanosoma* spp.in chicken only (Table 1 & Fig 1).

Table 1: Infection rate of haemoprotozoa in chickens and turkeys.

Birds' species	Number examined	Number infected	Infected rate %	No. of negative samples	Positive	
					Number of single infections [A]	Number of double and mixed infections [B]
Chicken	90	54	60	36	42 [a]	12
Turkeys	30	12	40	18	12 [b]	0

Different letters mean there is a significant variance at a significant level $P < 0.05$

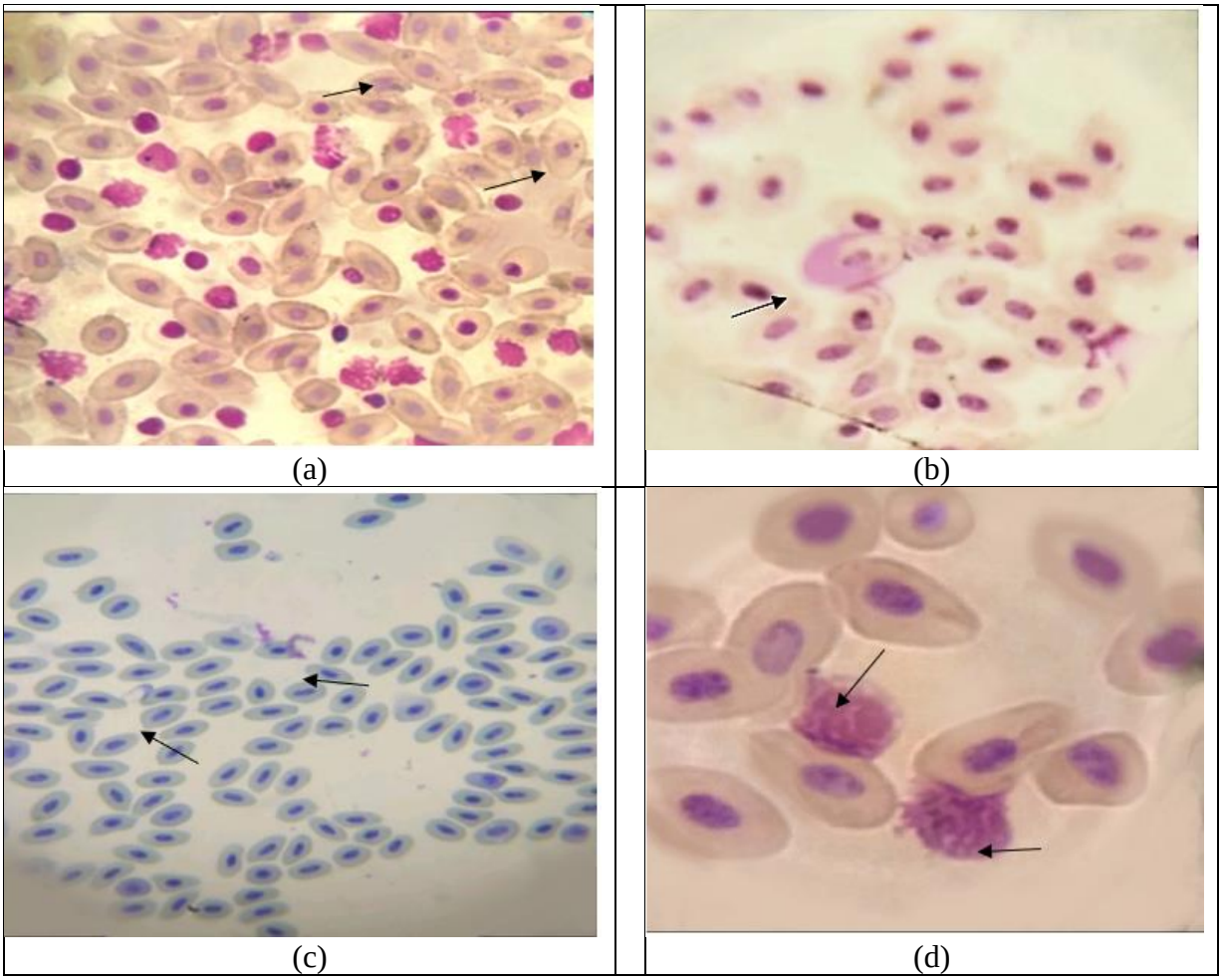

Fig (1) Haemoprotozoa stages in blood film in chicken

(a) Plasmodium spp. 1000x (gametocyte stages ring shape)
(b) Haemoproteus spp. 1000x gametocytes stage (discoid forms)
(c) Trypomastigote form of Trypansoma spp. 1000x
(d) Leucocytozoon spp. 1000x (gametocytes round shape)

In Mosul city, 33 out of 45 examined chickens tested positive for haemoprotozoa, resulting in an infection rate of 73.3%. Additionally, 6 out of 9 turkeys tested positive, yielding a rate of 66.6%. In Erbil City, the infection rates were lower, with 46.6% for chickens and 28.5% for turkeys, showing a significant variation (P<0.05) (Table 2).

The present investigation recorded a high prevalence in males (62.5%) in chicken, while in turkeys recorded high prevalence in females (50%) P<0.05 (Table 3).

Table 2: Infection rate of haemoprotozoa in chickens and turkeys according to region.

Birds' species	Mosul city		Erbil city	
	number examined	number infected%	number examined	number infected%
Chicken	45	33 (73.3%) [a]	45	21 (46.6%) [a]
Turkeys	9	6 (66.6%) [b]	21	6 (28.5%) [b]

Different letters mean there is a significant variance at a significant level P < 0.05

Table 3: infection rate of haemoprotozoa in chickens and turkeys according to sex

Birds' species	Total number examined (total number infected)	sex	number examined	number infected	Infection rate%
Chicken	90 (54)	Male	48	30 [a]	62.5%
		Female	42	24 [b]	57.1%
turkeys	30 (12)	Male	18	6 [c]	33.3%
		Famale	12	6 [d]	50%

Different letters mean there is a significant variance at a significant level P<0.05

The most commonly encountered haemoparasites in each chicken was *Plasmodium* (74.1%), *Plasmodium Leucocytozoon* (11.1%), *Plasmodium Haemoproteus* (9.3%), *Plasmodium Haemoproteus*, *Leucocytozoon* (1.8%) *Trypansoma* spp. (3.7%) (Table 4). While in turkeys was *Plasmodium* spp. (25%), *Leucocytozoon* spp. (33.3%). *Haemoproteus* spp. (41.6%) (Table 5).

DISCUSSION

The findings of our investigation have been detected the following genera of blood protozoa which affected the local hens and turkeys: *Trypanosoma*, *Plasmodium*, *Haemoproteus*, and Leucocytozoon. Our work's data is comparable to previous studies (Aiyedun *et al*., 2022; Al-Kaabi, 2021; Al-Rubaie, and Ibrahim, 2020; Gimba *et al*., 2014; Opara *et al*., 2014; Radfar *et al*., 2012).

Table 4: The percentage of infection with haemoprotozoa in chicken.

parasite spp.	infected number	infection %
plasmodium spp.	40	74.1 % [a]
Trypansoma spp.	2	3.7 % [b]
plasmodium spp. *Haemoproteus* spp.	5	9.3 % [c]
plasmodium spp. *Leucocytozoon* spp.	6	11.1 % [d]
plasmodium spp. *Haemoproteus* spp. *Leucocytozoon* spp.	1	1.8 % [e]
Total	54	

Different letters mean there is a significant variance at a significant level P < 0.05

Table 5: The percentage of infection with haemoprotozoa in turkey.

Parasites spp.	infected number	infection %
Plasmodium spp.	3	25 % [a]
Leucocytozoon spp.	4	33.3 % [b]
Haemoproteus spp.	5	41.6 % [c]
Total	12	

Different letters mean there is a significant variance at a significant level $P < 0.05$.

The infection predominance for the aforesaid genres of protozoa in this investigation was 60% in chickens and 40% in turkeys. This upshot is not in agreement with by (Opara *et al.,* 2014) were discovered in chickens that had low rates of blood infections, however turkeys had higher infection rates, with a frequency of 8.9% in chickens and 40% in turkeys in Nigeria. Okereke, (2010) also revealed 14% frequency among chicken raised locally in Imo State. Nonetheless. Our findings concur with study in Ghana (Poulsen *et al.,* 2000) were recorded prevalence infection with haemoparasites 35% in chicken in Ghana West Africa and 71% for Malawi (Njuga, 2000). Moreover, a propagation of 61.9 % has been recorded in Uganda (Valkiunas *et al*., 2005). This significant disparity may be explained by the different environmental factors that affect birds These factors involved insect vectors existence, conflict to protozoa, specimen time, steward immune system resistance, habitation attribute such as temperature, and rain-fall and steward specify of protozoa (Opara *et al*., 2014, Garcia-Longoria *et al*., 2019; Gutierrez-Lopez *et al.,* 2015; Rivero de Aguilar *et al*., 2018).

The 73.3%, 66.6 % The frequency of haemoprotozoa infections was found to be 46.6% and 28.5% in Erbil city and Mosul city, respectively, with a substantially greater prevalence in Erbil than in Mosul. These findings are consistent with earlier research (Hasson,2015; Valkiunas,2005).

This indicates that haemoprotozoa infections, a class of illnesses produced by protozoan parasites that affect a variety of animals inclusively birds and their populations, may represent a wide range of geographical changes. In the present study, show significant differences association between sex and haemo-protozoa infection was detected in chicken and turkeys, However, the reason for different prevalence across bird's sexes might be due to the differences in their reproductive activities (Adamu, 2017; Opara and Nwokedi, 2011).

Chickens and turkeys inspected in this investigation were infected mainly with *Haemoproteus* spp. *Leucocytozoon* spp*., Plasmodium*spp. and finally, *Trypano-soma* spp., which was infected with the chickens, this result is contract with a previous study (Permin and Hanson,1998) that show the haemoparasites primarily set up attacking poultry in the humid district involved *Leucocytozoon* spp. *Plasmodium* spp, *Aegyptinella* sp., *Haemoproteus* sp. and, *Trypanosoma* spp. The result also agreement with (Opara *et al*, 2014) blood protozoa that recorded prevalence rate (8.9%) in located chickens while (40%) in turkeys, The chickens parasitemia were *Leucocytozoon* spp., by a propagation percentage of (8.9%) in Nigeria. Also, in Sulaimani, Iraq was 78.2% the prevalence rate of haemosporidium parasites in chickens (Abdullah, 2013). Analogous genres of blood protozoa distinguished during examination were described for contaminate hens in Ethiopia (Adamu, 2017). In current study recorded infection with *Trypanosoma sp*. (3.7 %) in chicken this result agreement with a previous study (Saif *et al*., 2008) who showed A number of *Trypanosoma* species have been identified in poultry including *T. avium*, *T. gallinarum*, *T.numidae* and *T. calmetti*, however these parasites ensure minimal pathological effects on their

avian host. Additionally, the results recorded different rates of different haemoparasites during the study months in single, double and mixed infection with haemoprotozoa in different rates. It suggests that the parasite vectors in their environment and that insecticide use is minimal (Mirzaei *et al.*, 2020). The reasons behind the discrepancies in results across studies remain unclear, but could include factors associated with parasites infection such as the interval of seasonal blood samples picked up; the species' environmental and behavioral traits, the weather, the dissemination of habitat-relied on vectors, the host type, the age of the host (Fecchio *et al*., 2011; Sebaio *et al*., 2012).

CONCLUSION

The documents acquired from this study indicated that haemoprotozoa infections are widespread between chicken and turkeys by Mosul and Erbil city, Iraq. *Plasmodium* spp., *Haemoproteus* spp., *Leucocytozoon spp* had been infected chicken and turkey as well as infection with *Trypanosoma* spp. Were recorded in chicken. Gender was significantly accompanying through the haemoprotozoa infections among chicken and turkeys in the investigation district. Single, double and mixed haemoprotozoa infections were recorded in chicken and single infection in Turkeys was confirmed by this study.

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CONFLICT OF INTEREST

The authors announced that there are no matches of concern about the publication of this manuscript.

Ethical of approval

This study follows the ethics guidelines of the College of Veterinary Medicine, University of Mosul 2022

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الكشف عن الأوالي الدموية في الديوك الرومية والدجاج

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الطفيليات الدموية هي طفيليات دموية أولية توجد في كريات الدم الحمراء داخل الخلية وخارج الخلية بالإضافة الى تواجدها في أنسجة مضيفي الطيور. تهدف الدراسة الحالية الى الكشف وتشخيص طفيليات *Leucocytozoon* spp., *Plasmodium* spp., *Haemoproteus* spp. في جميع الدجاج المحلي والديوك الرومية التي تم فحصها في مدينة الموصل ومدينة أربيل. ولتحقيق هذا الهدف من الدراسة التي اجريت للفترة من أكتوبر 2021 حتى مارس 2022 من خلال فحص مسحات الدم للدجاج والديك الرومي .والتي اظهرت ارتفاع معدلات الإصابة بطفيليات الدم في شهر مارس يصل الى 100 %. من 120 عينة دم تم جمعها من الدجاج المحلي والديوك الرومية في مناطق مختلفة من مدينتي الموصل وأربيل, بلغت معدلات الاصابة بتطفل الدم بالأوالي الدموية في كلا المنطقتين في الدجاج المنزلي (*Gallus gallus domesticus*) 60% (90/54)، و بلغت نسبة تطفل الدم للأوالي الدموية في الديوك الرومية حوالي 40% (30/12) . أظهرت النتائج ارتفاع نسبة الانتشار عالية في ذكور الدجاج (62.5%) ، بينما سجلت في الديوك الرومية نسبة انتشارعالية في الاناث (50%) (P<0.05). بالإضافة الى تشخيص طفيلي *Trypanosoma spp.* في جميع مسحات الدم التي تم فحصها في الدجاج فقط.

الكلمات المفتاحية: *Leucocytozoon* spp., *Plasmodium* spp., *Haemoproteus* spp. *Trypanosoma* spp.