Received: 11.09.2024 | *Accepted: 17.09.2024*

Veterinary Sciences

doi: 10.31210/spi2024.27.04.20
UDC 616.993:636.92(567)
ORIGINAL ARTICLE

Scientific Progress & Innovations
https://journals.pdaa.edu.ua/visnyk

27 (4)
2024

Prevalence of internal parasites in local chicken in Karbala province, Iraq

N. A. Aljoboury[1] | M. Jawad[1] | A. Sh. M. Alhesnawi[2] | A. Alshimry[1] | F. Alali[3]

Article info

Correspondence Author
F. Alali
E-mail:
firas.o@uokerbala.edu.iq

[1] University of Kerbala,
College of Sciences,
56001, Karbala, Iraq

[2] University of Kerbala,
College of Applied Medical Sciences,
56001, Karbala, Iraq

[3] University of Kerbala,
College of Veterinary Medicine,
56001, Karbala, Iraq

Citation: Aljoboury, N. A., Jawad, M., Alhesnawi, A. Sh. M., Alshimry, A., & Alali, F. (2024). Prevalence of internal parasites in local chicken in Karbala province, Iraq. *Scientific Progress & Innovations*, 27 (4), 120–125. doi: 10.31210/spi2024.27.04.20

Gastrointestinal parasites are the most common and detrimental parasites impacting poultry productivity. Globally, *Eimeria* sp., *Ascaridia galli*, and *Heterakis gallinarum* are infect most variety of domestic and wild birds. The prevalence of endoparasite infection in the research area is presently mild and mostly influenced by farming practices; our findings can establish a baseline for managing infections in domestic hens. The research was carried out from January to August 30 2024 to ascertain the prevalence and diagnostic characteristics of parasite gastrointestinal illnesses. A total of 100 fresh fecal samples of backyard chickens were collected from different poultry markets. Fecal examination carried out by using the native method, and floating method to determine the presence of worm eggs. Identified among the nematodes were the following parasites: *Eimeria* sp., *Ascaridia galli*, and *Heterakis gallinarum*. The total prevalence was (22 %). The infection according to sex in *Eimeria* sp. was (63.6 %), (60.0 %), (66.7 %) in male and female, respectively. *Ascaridia galli* infection was (27.3 %), (30.0 %), (25.0 %) in male and female, respectively, and *Heterakis gallinarum* infection was (9.1 %), (10.0 %), (8.3 %) in male and female, respectively. The infection according to sex were. The infection according to age in *Eimeria* sp. was (63.6 %). *Ascaridia galli* infection was (27.3 %), and *Heterakis gallinarum* infection was (9.1 %). The prevalence of chickens in ages (one week to two years) were ranged between (0–100 %). A significantly, the prevalence of gastrointestinal parasite infections were related with age, sex, and avian species at ($p \geq 0.05$). The study found that *Eimeria* sp., *Ascaridia galli*, and *Heterakis gallinarum* were the most common gastrointestinal parasite infestations. In conclusion, to fully understand how gastrointestinal parasites affect the well-being and output of village hens, as well as to develop workable intervention and control strategies that smallholder farmers may use, more research is needed.

Keywords: Ascaridiosis, Chicken, Coccidiosis, Heterakiasis, Iraq.

Поширення ендопаразитозів курей у провінції Кербела, Ірак

Н. А. Альжобурі[1] | М. Джавад[1] | А. Ш. М. Алхеснаві[2] | А. Алшімрі[1] | Ф. Алалі[3]

[1] Науковий коледж університету Кербали, провінція Кербела, Ірак

[2] Коледж прикладних та медичних наук Університету, провінція Кербела, Ірак

[3] Коледж ветеринарної медицини Університету Кербали, провінція Кербела, Ірак

Інвазійні хвороби птиці, що викликані збудниками гельмінтозів та протозоозів травного тракту, вважаються найбільш розповсюдженими в усьому світі. Вказані збудники виявляють серйозну шкоду здоров'ю птиці. Зокрема, у молодняку реєструють зниження приростів, а в дорослої птиці зниження яйценосності та погіршенні якості отримуваних яєць. У всьому світі збудники *Eimeria* sp., *Ascaridia galli* та *Heterakis gallinarum* заражають більшість домашніх курей. У зв'язку з цим метою роботи було встановлення епізоотичної ситуації щодо розповсюдження шлунково-кишкових паразитів курей у провінції Кербела (Ірак). Дослідження проводилося з січня по 30 серпеня 2024 року. Загалом було зібрано 100 свіжих зразків посліду від домашніх курей з різних птахівничих господарств. Дослідження зразків проводилося в використанням загальновідомих флотаційних методів діагностики. Встановлено, що у досліджуваному районі в курей були виявлені паразитарні захворювання, викликані збудниками протозоозів (*Eimeria* sp.) та гельмінтозів (*Ascaridia galli* та *Heterakis gallinarum*). З'ясовано, що виявлені збудники у досліджуваний період мають незначне поширення (22,0 %), а рівень інвазованості птиці залежав від практики ведення сільського господарства. Слід зазначити, що ураженість птиці *Eimeria* sp. склала 63 %, *Ascaridia galli* – 27,3 %, а *Heterakis gallinarum* – 9,1 %. Різниці щодо поширеності збудників у птиці різної статі виявлено не було. За результатами копроовоскопічних досліджень встановлено, що ураженість курей збудником *Eimeria* sp. реєструється починаючи з першого тижня життя і до 2-х річного віку з незначними коливаннями. Натомість, перші випадки ураженості курей збудником *Ascaridia galli* починали реєструвати у вікових групах 1,5–2,0 міс та 3,5–5,0 міс. Наші дослідження можуть стати основою для проведення заходів направлених на лікування шлунково-кишкових інвазій у домашніх курей.

Ключові слова: кури, аскаридоз, кокцидіоз, гетеракоз, Ірак.

Бібліографічний опис для цитування: *Альжобурі Н. А., Джавад М., Алхеснаві А. Ш. М., Алшімрі А., Алалі Ф.* Поширення ендопаразитозів курей у провінції Кербела, Ірак. *Scientific Progress & Innovations*. 2024. № 27 (4). С. 120–125.

Introduction

Backyard chickens typically inhabit open housing and forage for food, which enhances their exposure to infectious parasite forms in the environment, hence elevating the risk of parasitic diseases [1]. Free-range chickens are susceptible to many parasite diseases when foraging [2]. Gastrointestinal parasites are reemerging in nations where the popularity of free-range chicken production systems is rising [3]. Helminth nematodes are common worldwide and more infections in chicken with considerable change during different areas and manufacture techniques [4].

Coccidian and helminths are worldwide threatened to free-range poultry production systems [5]. Coccidiosis and ascaridiosis are two more gastrointestinal parasites in scavenging poultry that cause production losses to owners [1]. Coccidiosis is suffering from the major economic losses in poultry hens. Gastrointestinal parasites infections have various clinical symptoms and result in variable impacts on chickens reduced egg production and body weight, malnutrition, and young bird's mortality [1, 6]. Coccidiosis is one of the main causes of morbidity in poultry, causing decrease of egg production and body weight. Backyard chickens put the food security of households at risk for both clinical and subclinical coccidiosis due to their outdoor living and scavenging activities [1].

Ascaridia galli is the most prevalent nematode in domestic and non-domestic chickens. Chickens raised in scavenging or semiscavenging systems have a high prevalence of *Ascaridia galli* [1]. It was reported in both intensive systems (broiler and layer farms) and free-range (backyard poultry) [7]. Chicken heterakosis, which is worldwide distribution at all countries. A high incidence of infection, particularly in young animals, results in their mortality, and invasive diseases inflict significant losses to this sector. The nematode *Heterakis gallinarum* is a parasite that has adapted to the climate of many different regions, which helps explain its widespread distribution [8].

Many of studies were reported in different regions of the country of Iraq. The following helminth parasites were detected from chickens in Mosul district, Iraq. Mostly was *A. galli*, then *Heterakis gallinae* [9]. While, who reported the total infection of intestinal helminthic parasites in local chickens was higher than farm chickens in Baghdad (khadhemiya, Abugarib, and Taji) [10]. Other study was reported the mix infection was the most predominant in house reared chickens from various parts of al dewania province with varies in age factors. The egg of the internal helminthes was *Ascaridia galli* was the most common then *Eimeria* sp., *Capillaria* sp., *Heterakis gallinarum* and *Raillietina* sp. [11].

Another study in local chickens in Erbil city region of Kurdistan/Iraq. The research was carried out in different species of local chickens to investigate the existence of internal parasites more prevalent of cestode species nematode species had a lower frequency and external parasites most prevalent with lice [12].

The importance of free-range chickens and the susceptibility to infection, in order to reduce infection, improve parasite control and reduce economic losses. We need to identification the prevalence and distribution of gastrointestinal parasites in Karbala province, Iraq.

The purpose of the study

This study aims to examine the frequency of gastrointestinal parasites in domestic chickens that are bred in Karbala province, Iraq.

Materials and methods

Site of the study

The research was conducted in karbala province. Karbala, also known as Kerbala, is the capital of the (Karbala district) is located in central Iraq map. The city is located 105 km southwest of Baghdad, bounded Governorate of Anbar in the north, Governorate of Najaf in the south, Governorate of Babylon in the east, the desert of Sham and the territories of Saudi Arabia in the west. The province is determined at a longitude of 44° and an altitude of 32°. The region of the Governorate of Karbala is roughly 5.034 square kilometers. The climate in Karbala features scorching summers and somewhat mild winters, rendering fall and spring the most agreeable seasons for travel. The best weather is often seen from October to April, when temperatures range from 15°C to 25°C (59°F to 77°F).

Fecal sample collection and Diagnosis

Sample Collection

A total of 100 fresh fecal samples of backyard chickens were collected from different poultry markets. Information about the samples and associated conditions was recorded on a questionnaire preformed. Qualitative examination methods included direct smear, and flotation, techniques. The samples were collected from different local markets laying hen farms between January 2024-to August 30/08/ 2024.

Coproscopical Examination and Identification of Endoparasites:

Fecal specimens were randomly collected from the cloaca immediately then placed in a clean bottle. The collected specimens were transferred in a cool box to the Kerbala University, College of Veterinary Medicine, Department of Parasitology, for laboratory examination. Fecal examination carried out by using the native method, and floating method to determine the presence of worm eggs. Fecal flotation method was included with (NaCl) solution that processes the flotation fluid [13]. The different species of the helminth parasites was diagnosed based on the guide of helminthological keys [14].

The positive specimens for one or more of the technique which have carried out (floatation method, direct wet smear) were regarded positive confirmed for (helminth(s) or/with Eimeria). All chickens were different of ages at the time of sampling, based on information obtained from their owners.

Detection of Eimeria oocysts and helminth eggs.

Helminth eggs and, Eimeria oocysts, from the identification techniques mentioned above were diagnosed using the guide morphological keys as initial detection. To prepare the flotation procedure, 400 g of NaCl was dissolved in 1000 ml of warm distilled water. Ten milliliters of the floating medium were added to the

fecal sample in the universal container, and the mixture was agitated with a rod to complete the operation. After passing by filtering the liquid through two layers of gauze and into a test tube, additional media was added until a meniscus appeared. The test tube was carefully covered with a coverslip and let to stand on a level surface for ten to twenty minutes. After carefully removing the coverslip and placing it on a glass slide, it was promptly checked for parasite eggs using x10 and x40 objective lenses. By adding Lugol's Iodine solution to the sample on the glass slide, the eggs were easier to identify [15].

Data and statistical analysis:

Microsoft Excel was used to record the data of the parasites that were collected. The following formula was used to determine the prevalence of infection (%):

Prevalence = (Total number of infected chickens by a species of parasite/total number of chickens examined) × 100.

Statistical analysis for social science; version 22.0, Chicago, USA. Chi-square test ($\chi 2$). $P<0.05$ was considered significant [16].

Results and discussion

The result showed that out of the 100 examined backyard chickens, 22 were positively infected with gastrointestinal parasites in the examined chickens, the total prevalence of infection was 22 % (22/100). All the positive samples were single infections were included, *Eimeria* sp., *Ascaridia galli* and *Heterakis gallinarum*.

The total prevalence of *Eimeria* sp. was 63.6 % (14/100). Concerning the genders, the prevalence of *Eimeria* sp., was 60 % (6/10) in male chickens while it was 66.7 % (8/12) in female chickens. Significant differences were not observed ($P\geq0.05$). While in *Ascaridia galli* the total prevalence was 27.3 % (6/22), in male was 30 % (3/10) and in female was 25 % (3/12). The prevalence of *Heterakis gallinarum* was 9.1 % (2/22), in male was 10 % (1/10), while in female 8.3 % (1/12), (***Table 1***, ***Figure. 1***).

Table 1
Relation of parasite types with genders

Parasite types * gender types Crosstabulation			
Parasite types		Sex types	
		male	female
Eimeria sp.	No	6	8
	%	60.0	66.7
Ascaridia galli	No	3	3
	%	30.0	25.0
Heterakis gallinarum	No	1	1
	%	10.0	8.3
Total	No	10	12
χ^2	0.105	*P value*	0.949

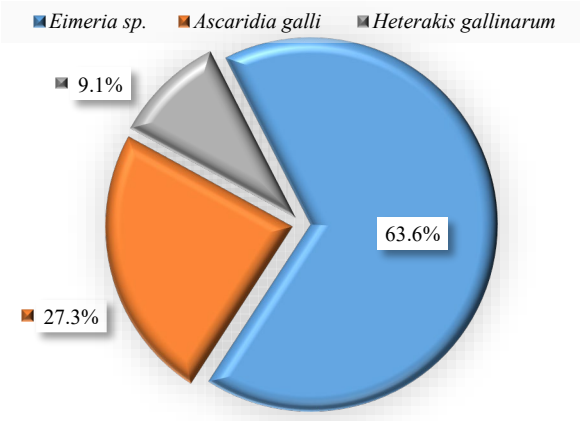

Figure. 1. Percentage of infections

The morphological characteristic of the recovered from the different chicken species were distributed at different percentages, (figures 1) The ages range between (one week to two years) with prevalence range between (0–100 %). Significant differences were not observed among ages ($P\geq0.05$). (***Table 2***).

Table 2
Relation of parasite types with ages

Parasite types * age cat. Crosstabulation																
Parasite types		Age														Total
		1w	2w	1.5m	2m	2.5m	3m	3.5m	5m	6m	7m	8m	1y	1.5y	2y	
Eimeria sp.	No	1	1	3	0	0	1	0	1	1	1	1	2	1	1	14
	%	100.0	100.0	75.0	0.0	0.0	100.0	0.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	63.6
Ascaridia galli	No	0	0	1	3	0	0	1	1	0	0	0	0	0	0	6
	%	0.0	0.0	25.0	75.0	0.0	0.0	100.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	27.3
Heterakis gallinarum	No	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2
	%	0.0	0.0	0.0	25.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1
Total	No	1	1	4	4	1	1	1	2	1	1	1	2	1	1	22
	%	100.0														
χ^2	26.452	*P value 0.438*														

Gastrointestinal parasites with direct and/or indirect life cycles, namely *A. galli*, *Eimeria* sp., *H. gallinarum* and *Capillaria* sp., are cause for the most common and high economic losses in poultry industries [5]. The result of this study have total prevalence of infection was 22 %, that out of the 100 examined backyard chickens, with gastrointestinal parasites in the examined chickens. 22 were positively infected were single infections only were included, *Eimeria* sp., *A. galli* and *H. gallinarum*. Flotation technique and routine method (direct smear)

were used to detect infections in (100) fecal samples backyard chickens. This study was consent with, who reported parasites mostly *Eimeria* sp. (32.83 %), then *A. galli* (30.15 %) and *H. gallinarum* (24.79 %) using floatation technique in Ilorin, Nigeria [17]. Other studies were used flotation as Malatji et al., 2016, was reported from (191) village chicken faecal samples from Limpopo and KwaZulu-Natal provinces South Africa's indicated mostly by *Eimeria* sp. (29.46 %), *A. galli* (18.77 %), and *H. gallinarum* (15.56 %) [18]. While in the Savanna region, Department of Sucre, Colombia, was reported, *Eimeria* sp. (90 %), *A. galli* (18.4 %), *H. gallinarum* (59.4 %), with prevalence 77.3 % (665/860) in hens (*Gallus domesticus*) [19]. These differences may be related with some factors as nature of nutrition, source of water, migrating birds, geographical location, housing, sample sizes, genetic, methods of parasitological detection, coinfections and breeding could demonstrate the varies in the rates of prevalence.

In the current, study the protozoan gastrointestinal parasite (*Eimeria* sp.) (63.6 %) was more common in gastrointestinal parasite cases than *A. galli* and *H. gallinarum*. In consent with helminth infection in local chickens slaughtered in Makurdi metropolis/ Nigeria. Out of the entire sample that was analysed, 280 out of 440 (63.6 %) had at least one helminthe species [20]. In poultry from the Veterinary Teaching Hospital, University of Jos, Plateau State, Nigeria. The total of 2,989 cases, out of which 749 (25.1 %), were *Eimeria* sp. (78.0 %) *A. galli* (8.3 %); and *H. gallinarum* (4.7 %) [21]. The important of chickens slaughtered for human consumption. Who reported only two parasites from two hindered and tens chickens in Maiduguri, Nigeria. Total infection was found in only 25.7 % of the local chickens. *A. galli* (84.1 %), *H. gallinarum* (15.9 %) [22].

While other studies no consent with this study as Kruchynenko, 2021, who recorded in Ukraine most common endoparasitoses in poultry are helminthiases and eimerioses, which can lead to severe illnesses, particularly in young birds [23]. *Eimeria* sp. (13.6 %), *A. galli*, (38.6%), and *H. gallinarum,* (29.6 %), are among the most prevalent hen gastrointestinal invaders, causing significant financial harm to poultry farms. Another research has been made in Viçosa, Minas Gerais, Brazil, *H. gallinarum* was the most prevalent helminth species (60.19 %). The majority of animals' gastrointestinal tracts yielded a total of 5579 specimens (81.55 %) [24]. Another research demonstrates that *A. galli* is the more distribute and high level prevalent of nematode in the broiler chicken of Rawalpindi region/Pakistan. The prevalence was 28.64 % (888/3100) chicken for the presence of *A. galli* [25]. In Duhok Province/Kurdistan Region of Iraq, one hundred and twenty chickens the local breed (*Gallus gallus domesticus*). The highest nematode recorded was *Subulura* sp. (46.6 %), followed by *A. galli* (38.3 %), *H. gallinarum* (25 %), *Eimeria* sp. (16.6 %) and *Capillaria* sp. (4.1 %) but no blood parasites and trematodes [26].

Many of studies in Iraq, have coinfections with different parasites, 260 chickens from local and farm breeding in Baghdad (Khadhemiya, Abugarib, and Taji) were found to have helminthes [10]. *A. galli* 35 (36.9 %) and *Raillietina tetragona* 15 (11.5 %) were the outcomes of farm breeding. Subulura brumpti 7 (5.3 %) and *H. gallinarum* 10 (6.7 %) were only detected in local chickens. The mixed infection was the most common study by Karawan, 2012, explain using 125 faecal samples of house reared chickens from al dewania city of different ages [11]. *A. galli* was the most common, *Eimeria* sp, *Capillaria* sp. *H. gallinarum*. The eggs of *Raillietina* sp. While, Abdullah and Mohammed, 2013 who reported macro- and microscopically found of (internal and external) parasites in Sulaimani region-Kurdistan/Iraq [27]. From 65 local chickens (*Gallus domesticus*) showed that 89.23 % out of 65 looked at chickens were infested by (*H. gallinarum*) which created 81 % and others were A. galli, Cheilospirura hamulosa, *Capillaria* sp., *Raillietina* sp., *Choanotaenia infundibulum*, *Amoebotaenia sphenoides*, *Hymenolepis carioca* and *Davaniea proglottina*) and Out of all the chickens inspected, 90.77 % had ectoparasite infestations (ticks and lice).Other study by Azeez and Yassin, 2024 who reported cestode more prevalent 65 % (42/65) and lower infection of 31 % (20/65) in local chickens in Erbil city, Kurdistan/Iraq [12].

In the current study the sex and ages don't have significant effects in three parasites for both male and female (P>0.05). This study in consent with, Montes-Vergara et al., 2021, in the Savanna region, Department of Sucre, Colombia [19]. Both sex and age had no significant effects. Using direct methods with ZnSO4, 860 native birds were examined, including both hens (*Gallus domesticus*). The results showed that 77.3 % (665/860) of the birds had at least one gastrointestinal parasite infection, including *Eimeria* sp. (90 %), *A. galli* (18.4 %), and *H. gallinarum* (59.4%) Elijah et al., 2022 who recorded significantly in females have much more nematode (*A. galli*) eggs and adults compared to male birds [27]. The prevalence mostly in female birds (48.6 %) than male (34.9 %) was significant (P≤0.05), in (210) local chickens in Maiduguri, Nigeria, Nematode identified were *A. galli* (84.1 %), *H. gallinarum* (15.9 %). While, Lawal et al., 2023 who recorded in Borno State, Northeastern Nigeria of overall prevalence of 54.8 % (438/800) from birds at live poultry markets. *A. galli* were the most common (14.6 %), *H. gallinarum* (9.8 %), as sex (female) and age (adults > 5mo), were significant (P<0.0001) [28].

In Ilorin, Nigeria, Ola-Fadunsin et al., 2019, who reported different parasites recovered from (597) fecal specimens and gastrointestinal from different of live and slaughtered bird species [17]. Using direct wet mount examination, avian types, sex, and Age were significant at (P<0.05) related with the incident of gastrointestinal parasites infection.

Conclusions

The current study shows the prevalence of gastrointestinal parasites in free backyard chickens in Karbala province/Iraq. The prevention of gastrointestinal parasites and biosecurity measures should be enhanced because the infection rate was comparatively high. The goal is to enhance the natural food supplies, housing, feeding, and management of these birds while encouraging the development of novel preventative and

therapeutic measures, such as the use of biological control and natural substances. The role of breeders and veterinarians is very important to prevent parasitic infection in farms via effective farms management, nutrition, and treatment. In order to stop the growth of the gastrointestinal parasites' developmental stages in the environment, it is advised that birds raised on the floor have proper litter management.

Conflict of interest

The authors declare no conflict of interest.

Acknowledgements

I would like to thank the owners of markets for supporting to collect samples in Karbala province, Iraq.

Ethical Statement

Ethics required are approved by the Ethical Committee of college of veterinary medicine/ university of Kerbala under acceptance number – UOK.VET. MI.2024.085.

Funding Information

There is no funding.

References

1. Muñoz-Gómez, V., Furrer, R., Yin, J., Shaw, A. P., Rasmussen, P., & Torgerson, P. R. (2024). Prediction of coccidiosis prevalence in extensive backyard chickens in countries and regions of the Horn of Africa. *Veterinary Parasitology*, 327, 110143. https://doi.org/10.1016/j.vetpar.2024.110143
2. Mlondo, S., Tembe, D., Malatji, M. P., Khumalo, Z. T. H., & Mukaratirwa, S. (2022). Molecular identification of helminth parasites of the Heterakidae and Ascarididae families of free-ranging chickens from selected rural communities of KwaZulu-Natal province of South Africa. *Poultry Science*, 101 (8), 101979. https://doi.org/10.1016/j.psj.2022.101979
3. Sharma, N., Hunt, P. W., Hine, B. C., & Ruhnke, I. (2019). The impacts of Ascaridia galli on performance, health, and immune responses of laying hens: new insights into an old problem. *Poultry Science*, 98 (12), 6517–6526. https://doi.org/10.3382/ps/pez422
4. Shifaw, A., Feyera, T., Walkden-Brown, S. W., Sharpe, B., Elliott, T., & Ruhnke, I. (2021). Global and regional prevalence of helminth infection in chickens over time: a systematic review and meta-analysis. *Poultry Science*, 100 (5), 101082. https://doi.org/10.1016/j.psj.2021.101082
5. Lozano, J., Ana, A., Salinero, A. P., Lux Hoppe, E. G., Gomes, L., Paz-Silva, A., Rebelo, M. T., & Madeira De Carvalho, L. (2019). Gastrointestinal parasites of free-range chickens – a worldwide issue. *Bulletin of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca. Veterinary Medicine*, 76 (2), 110–117. https://doi.org/10.15835/buasvmcn-vm:2019.0019
6. Mega, T. S., Susilowati, S., Hastutiek, P., Kusnoto, K., Sunarso, A., & Witaningrum, A. M. (2024). Identification of digestive tract endoparasites of laying hens in Suruhwadang village, Kademangan district, Blitar Regency. *Journal of Parasite Science*, 8 (1), 42–46. https://doi.org/10.20473/jops.v8i1.52373
7. Kumar, S., Garg, R., Ram, H., Maurya, P. S., & Banerjee, P. S. (2013). Gastrointestinal parasitic infections in chickens of upper gangetic plains of India with special reference to poultry coccidiosis. *Journal of Parasitic Diseases*, 39 (1), 22–26. https://doi.org/10.1007/s12639-013-0273-x
8. Omelchenko, O., & Yevstafieva, V. (2023). Epizootological monitoring studies of chicken heterakosis spreading on the territory of Poltava region. *Scientific Progress & Innovations*, 26 (3), 87–91. https://doi.org/10.31210/spi2023.26.03.16
9. Al-Hubaity, I. A., & Al-Habib, W. I. S. (1979) A survey of the helminth parasites of the domestic fowl (*Gallus gallus domesticus*) in Mosul district / Iraq. *Mesopotamia Journal of Agriculture*,14 (1), 197–204.
10. Shthar, M. M. (2010). A comparative study of gastrointestinal helminthes infection between local and farm breeding houses in Baghdad province. *Al-Anbar Journal of Veterinary Sciences*, 3 (1), 18–23.
11. Karawan, A. Ch. (2012). Prevalence of helminth in the alimentary tract of house reared chickens in Al-Dewania city. *Kufa Journal For Veterinary Medical Sciences*, 3 (2). https://doi.org/10.36326/kjvs/2012/v3i23956
12. Azeez, B. S., & Yassin, A. R. (2024). Prevalence of external and internal parasites and their effects on body performance to local chickens in Erbil City. *Diyala Journal for Veterinary Sciences*, 2 (2), 81–92. Retrieved from: https://djvs.uodiyala.edu.iq/index.php/djvs/article/view/178
13. Wozerou, N. N. (2014). Study of gastro-intestinal parasites of scavenging chickens in fako division, Southwest Cameroon. *The Journal of Advances in Parasitology*, 1 (3), 30–34. https://doi.org/10.14737/journal.jap/1.2.30.34
14. Soulsby, E. J. L. (1986). *Helminths, Arthropods & Protozoa of Domesticated Animals*. 7th Edition, London: Bailliere Tindall.
15. Asumang, P., Akoto Delali, J., Wiafe, F., Kamil, Z., Iddrisu Balali, G., Afua Dela Gobe, V., Nketiah Siaw, W., & Pinamang, G. (2019). Prevalence of Gastrointestinal parasites in local and exotic breeds of chickens in Pankrono–Kumasi, Ghana. *Journal of Parasitology Research*, 2019, 1–7. https://doi.org/10.1155/2019/5746515
16. Bajoi, M. S. J., Bhutto, B., Soomro, F., Solangi, I. A., Marri, N. U., Kakar, Z. K., Bangulzai, M., Baloch, A. L., Mangrio, R. A., Khosa, T. U. D., Mengal, M. A., Marri, N. M., & Kabir, A. (2024). Prevalence and characteristics of gastrointestinal parasites in backyard chickens of Khuzdar, Baluchistan. *Journal of Survey in Fisheries Sciences*. https://doi.org/10.53555/sfs.v11i4.2742
17. Ola-Fadunsin, S. D., Ganiyu, I. A., Rabiu, M., Hussain, K., Sanda, I. M., Musa, S. A., Uwabujo, P. I., & Furo, N. A. (2019). Gastrointestinal parasites of different avian species in Ilorin, North Central Nigeria. *Journal of Advanced Veterinary and Animal Research*, 6 (1), 108–116. https://doi.org/10.5455/javar.2019.f320
18. Malatji, D. P., Tsotetsi, A. M., Van Marle-Koster, E., & Muchadeyi, F. C. (2016). A description of village chicken production systems and prevalence of gastrointestinal parasites: Case studies in Limpopo and KwaZulu-Natal provinces of South Africa. *Onderstepoort Journal of Veterinary Research*, 83 (1). https://doi.org/10.4102/ojvr.v83i1.968
19. Vergara, D., Alvarez, J., & Cordero, A. (2021). Prevalence of gastrointestinal parasites in three groups of domestic poultry managed under backyard system in the Savanna subregion, Department of Sucre, Colombia. *Journal of Advanced Veterinary and Animal Research*, 8 (4), 1. https://doi.org/10.5455/javar.2021.h551
20. Ogbaje, C. I., Agbo, E. O., & Ajanusi, O. J. (2012). Prevalence of *Ascaridia galli*, *Heterakis gallinarum* and Tapeworm infections in birds slaughtered in Makurdi township. *International Journal of Poultry Science*, 11 (2), 103–107. https://doi.org/10.3923/ijps.2012.103.107
21. Ameji, N. O., Oladele, O. O., Adanu, A. W., Oshadu, D. O., Patrobas, M. N., Gurumyen, G. Y., & Biallah, M. B. (2022). Prevalence of parasitic gastrointestinal diseases of poultry diagnosed in the Veterinary Teaching Hospital, University of Jos, Nigeria. *Sokoto Journal of Veterinary Sciences*, 20 (1), 9–18. https://doi.org/10.4314/sokjvs.v20i1.2
22. Elijah, B. K., Onyiche, E. T., Midala, C., Luka, J., & Biu, A. A. (2022). Gastrointestinal helminths of local chickens (*Gallus gallus domesticus* Linnaeus) and guinea fowls (*Numida meleagris galeata* Pallas) Slaughtered in Maiduguri, Nigeria. *Sahel Journal of Veterinary Sciences*, 19 (4), 1–5. https://doi.org/10.54058/saheljvs.v19i4.338

23. Kruchynenko, O. V. (2021). Spreading of hen gastrointestinal parasitoses. *Bulletin of Poltava State Agrarian Academy*, 3, 236–241. https://doi.org/10.31210/visnyk2021.03.29
24. Valadão, M. C., Vieira, Í. S., Carvalho, L. M. de, Neves, P. H., Magalhães, R. T., Campos, A. K., & Araújo, J. V. de. (2021). Gastrointestinal helminth parasites of *Gallus gallus* raised in extensive system in the city of Viçosa, Minas Gerais, Brazil. *Brazilian Journal of Veterinary Medicine*, 43 (1), e002121. https://doi.org/10.29374/2527-2179.bjvm002121
25. Yousaf, A., Saleh Tabasam, M., Memon, A., Rajput, N., Shahnawaz, R., Rajpar, S., Jamil, T., & Mushtaq, M. (2019). Prevalence of Ascaridia galli in different broiler poultry farms of potohar region of rawalpindi-pakistan. *Journal of Dairy, Veterinary & Animal Research*, 8 (1), 71–73. https://doi.org/10.15406/jdvar.2019.08.00245
26. Al-Saeed, A., & AL-Badrani, M. (2014). Study of the parasites of the local chickens (*Gallus gallus domisticus*) in Duhok province, Kurdistan Region-Iraq. *Science Journal of University of Zakho*, 2 (1), 18–23. https://doi.org/10.25271/2014.2.1.110
27. Abdullah, S. H. (2013). Ecto and endo parasites prevalence in domestic chickens in Sulaimani Region. *The Iraqi Journal of Veterinary Medicine*, 37 (2), 149–155. https://doi.org/10.30539/iraqijvm.v37i2.275
28. Lawal, J. R., Jajere, S. M., Isa Ibrahim, U., Abubakar Biu, A., & Jonathan, D. (2023). Epidemiology of gastrointestinal helminths among chickens (*Gallus domesticus*) from Borno State, Northeastern Nigeria: prevalence, helminth burden and associated risk factors. *Revue d'élevage et de Médecine Vétérinaire Des Pays Tropicaux*, 76, 1–9. https://doi.org/10.19182/remvt.37127

ORCID

N. A. Aljoboury https://orcid.org/0009-0001-8064-2040
M. Jawad https://orcid.org/0000-0003-2927-9220
A. Sh. M. Alhesnawi https://orcid.org/0000-0003-4172-581X
A. Alshimry https://orcid.org/0009-0009-0320-1717
F. Alali https://orcid.org/0000-0002-3438-6453