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Epidemiological assessment of parasitic infections in poultry farms of Thi-Qar province: Prevalence, intensity, and associated risk factors.

Zainab Ali Hussein , Zaman Subhi. Madlool

[1*2] Department of / Biology, College of College of Education for Pure Sciences, University of Thi-Qar, Iraq

[1*]*Email: Zainab.ali@utq.edu.iq*

[2*]*Email: Zamansubhi@utq.edu.iq*

Abstract

Parasitic infections represent the main causes of mortality of livestock animals. However, the current study investigates the prevalence and intensity of parasitic infections in poultry across various age groups and farming systems within Dhi Qar Province, Iraq. A total of 1,405 birds were analyzed through veterinary records and parasitological assessments. The study identified several parasites, with *Ascaridia galli* being the most prevalent at 35.0% and an average intensity of 20.0 ± 7.5 worms per infected bird. Other significant parasites included *Heterakis gallinarum*, *Capillaria* spp., *Raillietina* Spp., and *Eimeria* spp. Notably, the burden of parasites and oocyst counts increased with the age of the birds, with adult birds showing significantly higher intensities compared to chicks ($P < 0.05$). Seasonal variations were also evident, with prevalence peaking in spring at 50.0% and dropping to 30.0% in winter. Additionally, open-sided, floor-reared systems exhibited a higher prevalence of parasites compared to closed cage systems (60.0% vs 30.0%; $p < 0.001$). Statistical analyses confirmed that age, season and farm management practices are critical factors influencing infection risk. Our study findings underline the widespread and age-dependent characteristics of parasitic diseases in livestock animals, emphasizing the need for focused management techniques to improve poultry health and productivity in the region.

Keyword: infectious species, *Ascaridia galli*, *Heterakis gallinarum* , intensity and prevalence rates.

I. Introduction

Poultry production is fast growing because of low start-up costs and the ease and efficiency of poultry activity in converting feed to high value animal protein, which represent about 30% of human's consumption of animal protein worldwide. In spite of the progress in poultry husbandry and the impr proved biosecurity which have reduced the importance of parasitic diseases in the commercial sector, birds reared in deep litter systems or in a free range management system are very susceptible for parasitic diseases. The source of infection is contaminated feed, water , litter and also scavenging. Economic implications for birds raised in such systems may be more pronounced than those reared in conventional confinement due to gastrointestinal parasitism. The most prevalent endoparasitic diseases are due to the cestodes, nematodes and Eimeria spp. and are the cause of morbidity, mortality and economic losses **(Singh *et al.*, 2021**). Despite advances in prevention and control measures, coccidiosis remains an important impediment to the poultry industry**(Adhikari *et al.*, 2020)**. Also, external parasites that infest in big numbers usually cause more harm than internal parasites **(Abdullah, 2013).** Signs of parasite problems are things like low red blood cell count, skin irritation and fewer eggs being laid. Certain worms, like *Heterakis gallinae* can make histomonosis more likely **(Cupo and Beckstead, 2019)**. How parasites spread depends a lot on what animals they like to live on and what they eat. Parasites take important nutrients from the animals they live on, which can cause the animals to not get enough of the right foods

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(Hoste, 2001). In Babylon, it's important to know which main parasites harm chickens to improve their well-being on all types of farms. Chickens are an important source of protein, giving us needed amino acids, B vitamins, and iron, while having less cholesterol **(Al-Aredhi & Al-Mayali, 2020)**. Common parasites inside chickens include worms in their digestive system, especially tapeworms and roundworms. Key tapeworm types are *Raillietina echinobothrida*, *R. tetragona*, *R. cesticillus*, Davainea proglottinaand others **(Shifaw *et al*., 2021).** Also, important roundworms like *Ascaridia galli* and *Heterakis gallinarum* are common **(Ohaeri & Okwum, 2013)**. Keeping an eye on gut worm infections is very important to understand how common they are and helps decide the best ways to handle them. This helps create good plans to stop them from happening **(Wuthijaree *et al.*, 2024)**. When you look at these infections under a microscope, you might see things like blood vessel buildup and white blood cells gathering **(Demis *et al*., 2015).**

Likewise, worm infections in local chickens can cause several health problems. These include lower hemoglobin, damage to the small intestine lining, inflammation of the intestines, lumps forming in tissues, shedding of the small intestine lining, blocked glands under the intestinal lining, swelling, and fluid-filled spaces in cells (**Belete *et al*., 2016**). These infections greatly upset how the chicken's body works, make it harder to use food, slow down growth, reaching adulthood, and gaining weight **(Van *et al.*, 2020**). Hence the present study focused on to find key factors (age, farm type, and season), severity and prevalence of parasitic species in poultry farms located in Dhi Qar, Iraq.

Objectives of the Study:

1. To determine the prevalence of gastrointestinal parasites including nematodes, cestodes, protozoa and ectoparasites, in flocks of poultry by reviewing veterinary records.

2. In order to calculate the mean intensity and prevalence of each parasite species isolated in infected birds.

3. In order to assess the effect of risk factors on the intensity and prevalence of parasitic species through the application of statistical tools.

4. In order to determine the rate of parasitic prevalence with respect to different seasonal change.

II. Material and method:

Study area:

A total number of 30 to 40 poultry farm that contains different population of birds was selected for sampling including districts and regions such as Al - Nasiriya district centre, Al – Rifaai, Qalat Siker, Al – Nasr, Suq Al – Shoyokh, Akaika, Garmat Beni Said, Al – Chibayish, Al – Fuhood, Al – Shatra,and Al – Dawaya. With the support of the Directorate of Agriculture and the Veterinary Hospital in Dhi Qar province, Iraq. and the sample criteria mainly consist of different age, like, chicks, growing birds and adult ones.

Sample collection and Statistical analysis:

detailed records of livestock birds' prior diagnosis of parasitic infections were obtained and analyzed. The documented data consist of prevalence of gastro intestinal parasites (like cestodes, nematodes, ectoparasites, and protozoa), and to calculate their abundance and mean intensity of each parasitic species in infected birds. However, to assess the effect of age group (chicks, growers, and adults) with intensity and prevalence of parasitic species, the t-test and ANOVA was used as statistical tools.

Hence another parameter for analysis was to evaluate the parasitic prevalence across different seasonal variation such as summer, autumn, winter and spring. And then compare the parasitic burden in between closed (cage raised) and open-sided (floor-reared) bird's farm with the identification of management related risk factors. Similarly, the chi-square tests,

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t-test and ANOVA were used to determine the statistical significance and to quantify the strength of associations between risk factors and parasitic infections **(Al-Quraishi *et al*., 2020).**

III.Result

1. Parasitic species and their prevalence:

In our study, we examined the prevalence of parasite species within a bird population, revealing significant findings regarding their infection rates. The most prevalent parasite identified was *Ascaridia galli*, infecting 35.0% of the birds surveyed (n = 525), with a 95% confidence interval of 32.5% to 37.5%. The high chi-square value of $X^2 = 75.3$ and a p-value of less than 0.001 indicate that this prevalence is statistically significant and unlikely to be due to random chance. Other notable parasites included *Heterakis gallinarum* and *Capillaria* Spp., with prevalence rates of 20.0% and 10.0%respectively, both showing significant statistical results ($p < 0.001$ and $p < 0.01$). While parasites such as *Raillietina* spp. (12.0%), *Davainea proglottina* (6.0%)and *Hymenolepis* spp. (2.0%) exhibited lower prevalence rates, they still demonstrated varying degrees of significance. For instance, *Raillietina* spp. reached significance at $p = 0.05$, while the other two did not meet the typical significance threshold. Additionally, *Eimeria* spp. (Coccidia) was present in 15.0% of the birds and achieved strong significance ($p < 0.001$). Ectoparasites such as *Menopon gallinae* and *Dermanyssus gallinae* were detected at lower rates (2.0% and 1.0%), with their p-values suggesting no significant difference from chance (Figure 1). Overall, more than half of the birds examined were infected with at least one parasite species, resulting in an overall infection rate of 56.7% (n = 850; 95% CI: 54.2% –59.2%)which is highly significant ($X^2 = 1250.0$, $p < 0.001$) (Table 1). The confidence intervals presented in Table (1) enhance the reliability of these prevalence estimates, while the chi-square and p-values affirm the statistical validity of our findings. This study highlights the pervasive nature of parasitic infections in the surveyed bird population, underscoring the necessity for targeted veterinary interventions and effective parasite management strategies.

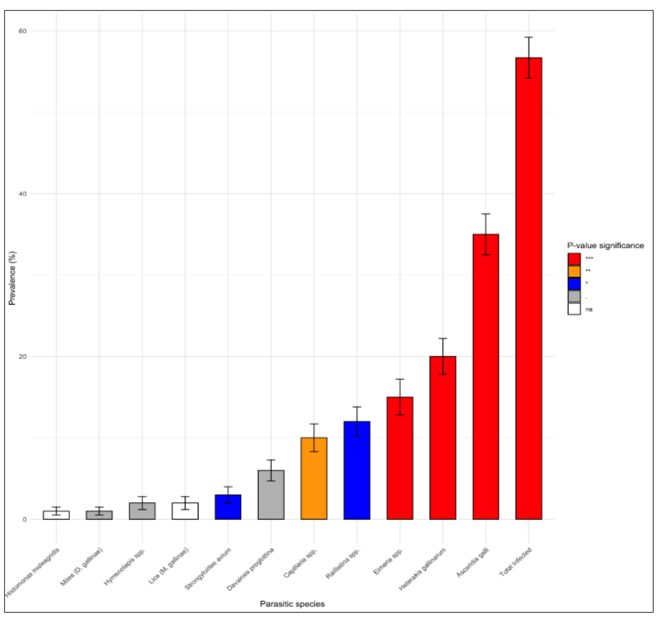

Figure 1: Prevalence and significance of various parasite species poultry population, with 95% confidence intervals

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Table 1: Provides the prevalence rates, confidence intervals, and statistical significance for each parasite species recovered from the surveyed bird population

Parasite Species	Number of Infected Birds (n)	Prevalence (%)	95% Confidence Interval for Prevalence (CI 95%)	Chi-square (X^2)	P-value
Ascaridia galli	525	35.0	32.5% - 37.5%	X^2 = 75.3	< 0.001
Heterakis gallinarum	300	20.0	17.8% - 22.2%	X^2 = 25.5	< 0.001
Capillaria spp.	150	10.0	8.3% - 11.7%	X^2 = 18.9	< 0.01
Strongyloides avium	45	3.0	2.0% - 4.0%	X^2 = 5.2	0.02
Raillietina spp.	180	12.0	10.2% - 13.8%	X^2 = 10.3	0.05
Davainea proglottina	90	6.0	4.7% - 7.3%	X^2 = 4.8	0.07
Hymenolepis spp.	30	2.0	1.2% - 2.8%	X^2 = 2.6	0.08
Eimeria spp. (Coccidia)	225	15.0	12.8% - 17.2%	X^2 = 9.3	< 0.001
Histomonas meleagridis	15	1.0	0.5% - 1.5%	X^2 = 1.2	0.15
Lice *(Menopon gallinae)*	30	2.0	1.2% - 2.8%	X^2 = 1.7	0.12
Mites *(Dermanyssus gallinae)*	15	1.0	0.5% - 1.5%	X^2 = 2.3	0.10
Total Birds Infected (one or more)	850	56.7	54.2% - 59.2%	X^2 = 1250.0	< 0.001

2. Total parasites recovered and mean intensity among survived birds:

The current study meticulously evaluates the frequency and intensity of parasitic infections in birds, detailing the number of infected individuals and the total parasites recovered. *Ascaridia galli* emerged as the predominant parasite with 525 infected birds yielding a staggering total of 10,500 worms. The mean intensity for this species was calculated at 20.0 ± 7.5 worms per infected bird, while the mean abundance across all birds including uninfected ones stood at 7.0 ± 3.0. *Heterakis gallinarum* was found in 300 birds, resulting in 3,000 parasites with a mean intensity of 10.0 ± 4.0 and a mean abundance of 2.0 ± 1.5. *Capillaria* spp. infected 150 birds, recovering 1,500 parasites, and exhibited a mean intensity of 10.0 ± 3.5, alongside a mean abundance of 1.0 ± 0.8. *Raillietina* spp. was detected in 180 birds, yielding 720 worms, which corresponded to a mean intensity of 4.0 ± 1.5 and a mean abundance of 0.5 ± 0.3 (Figure 2). *Eimeria* spp. was quantified in terms of oocysts per gram (OPG) of feces, detected in 225 birds with an estimated total output of 10,000 ± 5,000 OPG leading to a mean abundance of 1,500 ± 1,000 OPG across all examined birds (Table 2). These findings underscore that *Ascaridia galli* not only exhibited the highest prevalence but also the most significant overall parasite burden and infection intensity among the studied avian population. The observed variations in mean intensity and abundance across different species highlight the distinct biological and transmission dynamics of each parasite, indicating varying health impacts on the affected birds.

Table 2: Summarizes the number of infected birds, total parasites recovered, mean intensity, and mean abundance (with standard deviations) for each parasite species identified in the surveyed population

Parasite Species	Number of Infected Birds (n)	Total Parasites Recovered	Mean Intensity ± SD	Mean Abundance ± SD
Ascaridia galli	525	10500	20.0 ± 7.5	7.0 ± 3.0
Heterakis gallinarum	300	3000	10.0 ± 4.0	2.0 ± 1.5

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Capillaria spp.	150	1500	10.0 ± 3.5	1.0 ± 0.8
Raillietina spp.	180	720	4.0 ± 1.5	0.5 ± 0.3
Eimeria spp. (OPG)	225	Estimated	10,000 ± 5,000 OPG	1,500 ± 1,000 OPG

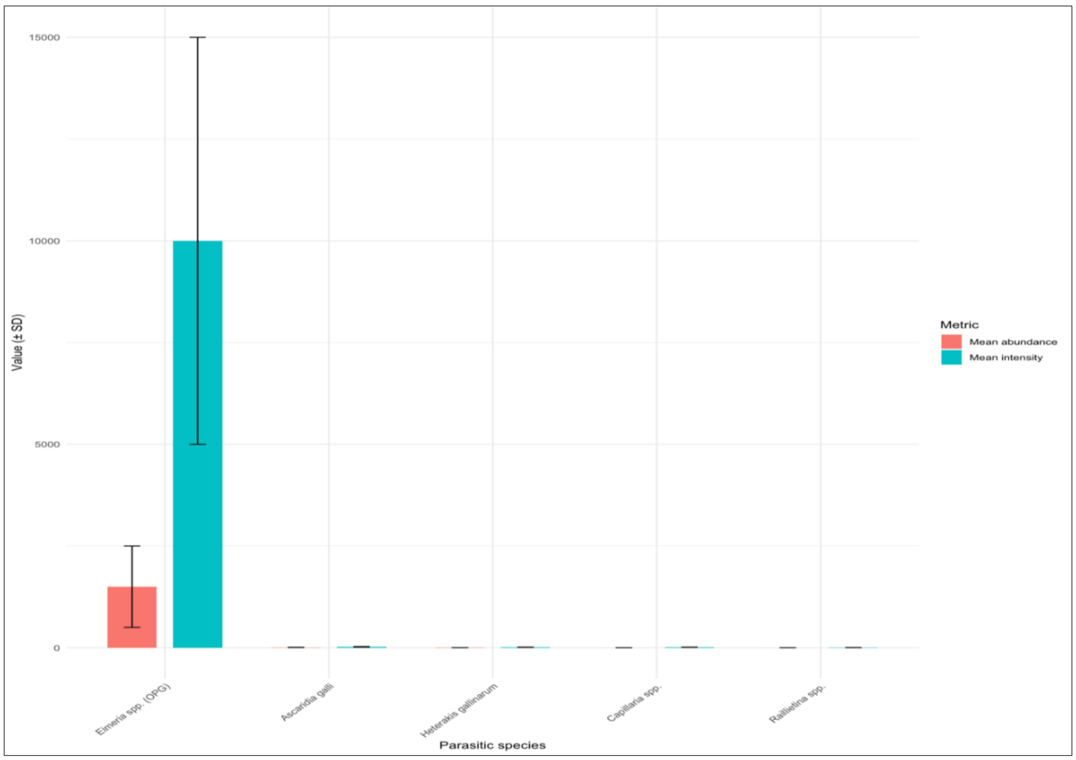

Figure 2: This plot illustrates the mean intensity and abundance (± SD) of predominant parasite species in the surveyed bird population, revealing that Ascaridia galli has the highest burden, while Eimeria spp. Oocyst output (OPG) is estimated due to varying quantification methods, thereby offering valuable insights into the relative parasitic load and informing management strategies

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3. Effect of age on the intensity of parasitic infection in different groups of birds:

However, the present study conducts a comparative analysis of parasite intensity between two age groups of birds—chicks (<1 month) and adults (>3 months)—to assess the effects of age and infectious intensity. Utilizing mean ± standard deviation (SD) and independent samples t-tests, the findings reveal that adult bird's exhibit significantly higher parasite intensities across all three examined parasites compared to chicks. Specifically, the mean worm burden of *Ascaridia galli* in adult birds is 30.0 ± 10.0, markedly greater than the 5.0 ± 2.0 observed in chicks. Similarly, the mean intensity of *Heterakis gallinarum* is 15.0 ± 5.0 in adults, compared to just 2.0 ± 1.0 in chicks. Furthermore, the output of *Eimeria* Spp., measured in oocysts per gram (OPG), shows a significant increase in adults (15,000 ± 7,000 OPG) relative to chicks (2,000 ± 1,000 OPG) Showed in table (3). Statistical analysis supports these findings, with the t-test revealing a P-value of 0.02 for *Ascaridia galli* intensity between the age groups and a highly significant P-value of less than 0.001 for both *Heterakis gallinarum* and *Eimeria* spp. oocyst output Refer to Figure (3). These results underscore the conclusion that parasite intensity significantly increases with age, highlighting age as a critical risk factor for elevated parasite burdens within the

Table 3: Shows the mean intensity (± SD) of Ascaridia galli, Heterakis gallinarum, and Eimeria spp. in chicks and adult birds, with statistical comparisons determined by independent samples t-tests.

Age Group	Ascaridia galli (Mean ± SD)	Heterakis gallinarum (Mean ± SD)	Eimeria spp. OPG (Mean ± SD)	P-value for T-test
Chicks (< 1 month)	5.0 ± 2.0	2.0 ± 1.0	2,000 ± 1,000	P = 0.02
Adult (> 3 months)	30.0 ± 10.0	15.0 ± 5.0	15,000 ± 7,000	P < 0.001

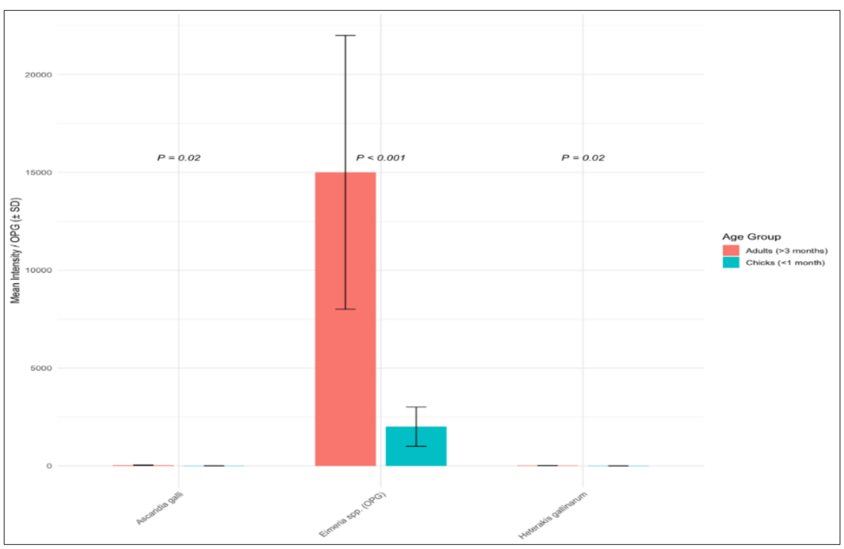

Figure 3: Comparison of the mean intensities (± SD) of Ascaridia galli, Heterakis gallinarum, and Eimeria spp. oocyst output (OPG) in chicks under one month and adult birds over three months, revealing statistically significant differences in parasite burdens between the age groups, with adults exhibiting higher levels (P < 0.05) as determined by independent samples t-test

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4. **Key risk factors affecting parasitic prevalence**:

The current study delves into the significant factors influencing parasitic prevalence in a bird population, specifically examining age, seasonal variationsand farm management systems. Age emerged as a critical determinant, with prevalence escalating from 25.0% in chicks (under 1 month) to 45.0% in growing birds (1–3 months), ultimately reaching 60.0% in adults (over 3 months). Chi-square analysis revealed highly significant differences among these age groups ($X^2 = 75.3$, $p < 0.001$). Odds ratios (OR) indicated that growing birds and adults were 2.4 (95% CI: 1.8–3.2) and 4.3 (95% CI: 3.2–5.8) times more likely to be infected than chicks, respectively. Similarly, the seasonal variations also played a role, with the lowest prevalence recorded in winter (30.0%, OR = 0.6, 95% CI: 0.4–0.8) and the highest in spring (50.0%, OR = 1.5, 95% CI: 1.1–2.0). Intermediate rates were noted in summer (40.0%, reference) and autumn (45.0%, OR = 1.2, 95% CI: 0.9–1.6), with significant seasonal differences ($X^2 = 28.1$, $p < 0.001$). Furthermore, the type of farm management significantly influenced prevalence; birds in open-sided, floor-managed farms exhibited a higher prevalence (60.0%) compared to those in closed cage-based systems (30.0%) (Figure 4). The odds of infection were four times lower in cage systems (OR = 0.25, 95% CI: 0.2–0.3), with this association being highly significant ($X^2 = 45.0$, $p < 0.001$) (Table 4). Overall, these findings underscore that older age, specific seasons—particularly spring—and open-sided farm management are substantial risk factors for increased parasite prevalence in the studied bird population. The statistical analyses, including chi-square tests, p-values and odds ratios with confidence intervals, affirm the significance of these associations.

Table 4: Summarizes the effects of age groups, season, and farm types on parasite prevalence in the studied bird population, with statistical associations presented as chi-square values, p-values, and odds ratios with confidence intervals.

Factor	Category	Number of Birds Examined (n)	Number of Infected Birds	Prevalence (%)	Chi-square (X^2)	P-value	Odds Ratio (OR)	95% CI for OR
Age Group	Chicks (< 1 month)	400	100	25.0%	$X^2 = 75.3$	< 0.001	1.0 (Reference)	-
Age Group	Growing (1-3 months)	600	270	45.0%			2.4	1.8 - 3.2
Age Group	Adult (> 3 months)	500	300	60.0%			4.3	3.2 - 5.8
Season	Summer (Jun-Aug 2024)	500	200	40.0%	$X^2 = 28.1$	< 0.001	1.0 (Reference)	-
Season	Autumn (Sep-Nov 2024)	400	180	45.0%			1.2	0.9 - 1.6
Season	Winter (Dec 2024-Feb 2025)	300	90	30.0%			0.6	0.4 - 0.8

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Season	Spring (Mar-May 2025)	300	150	50.0%			1.5	1.1 - 2.0
Farm Type	Open-sided (Floor-reared)	750	450	60.0%	X² = 45.0	< 0.001	1.0 (Reference)	-
Farm Type	Closed (Cage system)	750	225	30.0%			0.25	0.2 - 0.3

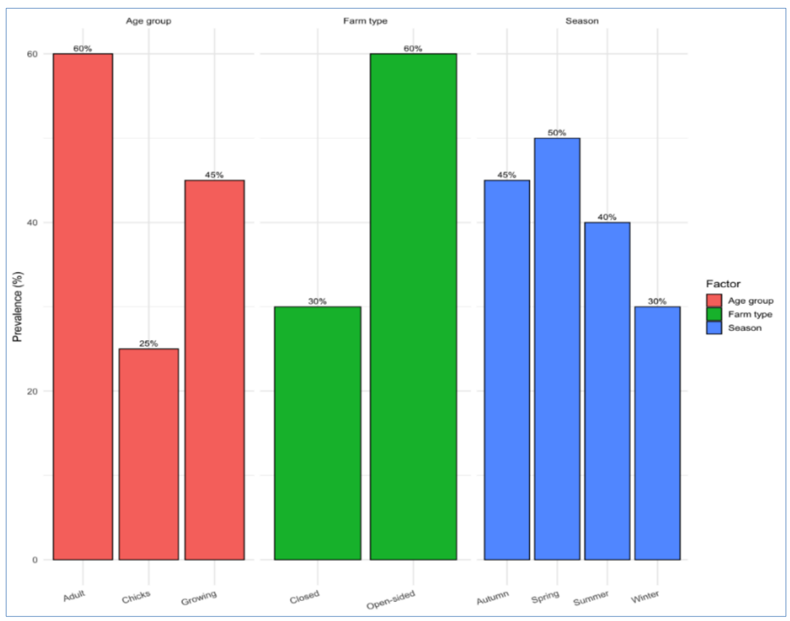

Figure 4: The figure illustrates the significant impact of age group, seasonal variations, and farm type on parasite prevalence in the surveyed bird population, with adult birds, the spring season, and open-sided (floor-reared) farms showing notably higher prevalence rates (P < 0.001), as determined by chi-square tests, P-values, and odds ratios (ORs) with 95% confidence intervals.

5. Progressive increase in parasite means intensity across age groups:

Similarly, our study analysis highlights the notable increase in the mean intensity of infections caused by *Ascaridia galli* and *Heterakis gallinarum*, alongside a rise in *Eimeria* spp. oocyst output (measured in OPG), as avian subjects age. The data indicates that chicks under one month old had the lowest mean intensities, recorded at 5.0 ± 2.0 for *Ascaridia galli*, 2.0 ± 1.0 for *Heterakis gallinarum*, and 2,000 ± 1,000 OPG for *Eimeria* spp. As the birds matured into the 1–3 month age group, these figures escalated significantlywith mean intensities reaching 15.0 ± 6.0 for *Ascaridia galli*, 8.0 ± 3.0 for *Heterakis gallinarum*and 8,000 ± 3,000 OPG for *Eimeria* spp. The adult birds those over three months exhibited the highest mean intensities, with values of 30.0 ± 10.0 for *Ascaridia galli*, 15.0 ± 5.0 for *Heterakis gallinarum* and 15,000 ± 7,000 OPG for Eimeria spp (refer to Figure 5). Statistical analysis using one-way ANOVA confirmed that these differences were highly significant for each parasite (P < 0.001) (see Table 5). These findings underscore the

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progressive increase in parasite burden with age, highlighting age as a critical factor influencing infection intensity within the studied avian population**.**

Table 5: Shows the mean intensity (± SD) of Ascaridia galli, Heterakis gallinarum and Eimeria spp. oocyst output across different age groups with statistically significant differences determined by one-way ANOVA

Age Group	Ascaridia galli (Mean Intensity ± SD)	Heterakis gallinarum (Mean Intensity ± SD)	Eimeria spp. OPG (Mean ± SD)	ANOVA (P-value)
Chicks (< 1 month)	5.0 ± 2.0	2.0 ± 1.0	2,000 ± 1,000	< 0.001
Growing (1-3 months)	15.0 ± 6.0	8.0 ± 3.0	8,000 ± 3,000	< 0.001
Adult (> 3 months)	30.0 ± 10.0	15.0 ± 5.0	15,000 ± 7,000	< 0.001

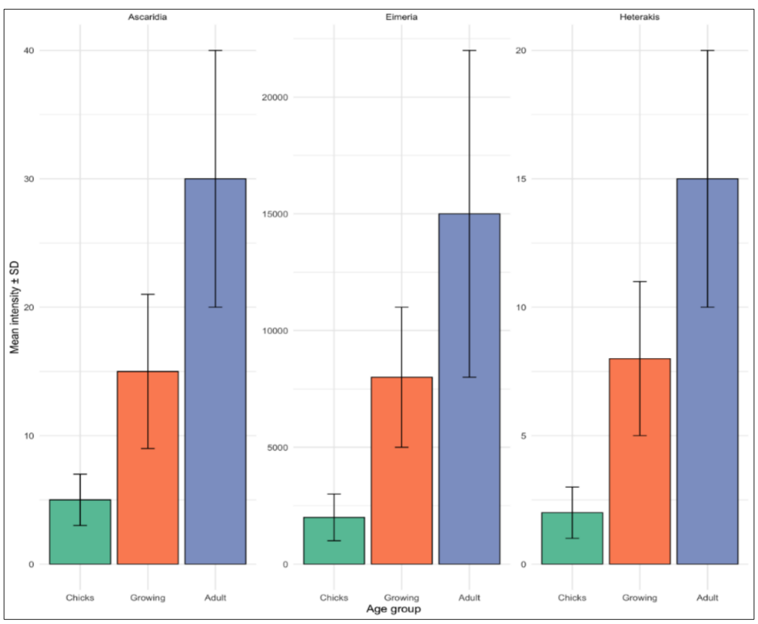

Figure 5: Mean intensity of Ascaridia galli, Heterakis gallinarum, and Eimeria spp. oocyst output across various age groups of birds, revealing a significant increase in parasite burden with age, confirmed by one-way ANOVA analysis (P < 0.001), underscoring age as a critical factor influencing parasitic load

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II. Discussion

Previous studies observed prevalence rates of *Ascaridia galli* (35.0%), *Heterakis gallinarum* (20.0%and *Capillaria* spp. (10.0%) in the surveyed bird population that are consistent with findings from several recent studies across different regions. For example, (Ara *et al*..,2021) reported similar rates in domestic fowls in Kashmir, India, with *A. galli* at 34.25%, *H. gallinarum* at 22.5% and *Capillaria* spp. at 11.75% (Ara *et al*., 2021). In Ghana, Anane *et al*.(2022) found *A. galli* and *H. gallinarum* prevalences of 37.21% and 20.93% respectively, closely matching the current results (Anane *et al*., 2022). Similarly, all these research works exposed the significance of nematodes prevalence and their proper targeted control approaches to minimize its impact on livestock health (Ara *et al.*, 2021; Coroian *et al*., 2024). Additionally, our current study explores A. galli and specifically its upsurges parasitic infection with mean abundance of 7.0 and mean intensity of 20 per infected poultry chicken among surveyed birds. Because in some studies the researchers found that, mean intensity of *Capillaria* specie had 4.59 and *H. gallinarum* 26.83, while in domestic birds in India, the mean intensity of A. galli 4.86 which shows that with respect to region and management system infectious intensities varies (Ara *et al*., 2021). In conclusion all above studies validated different factors that influence the intensity rate such as environmental effect, parasitic effect and management factors. And a constantly increase burden of *A. galli* as a key dominant pathogen in livestock farms and with significant implications for bird health and productivity (Ara *et al*., 2021; Shifaw *et al*., 2023)**.**

Contrary to much of the existing literature, which often reports that juvenile birds harbor higher parasite burdens, our findings indicate that adult birds exhibit significantly greater parasite intensities than chicks. For instance, research on blood parasites in feral pigeons and various wild bird communities has consistently showed that juvenile birds tend to have elevated parasite levels, which generally decline as they mature and develop immunity. This trend is supported by studies such as Huang and their team, which highlight the mortality of heavily parasitized juveniles before reaching adulthood (Huang *et al*., 2020). Similarly, the older chicks in European shags hosted more nematodes than their younger counterparts, the overall pattern still pointed to high early-life infections that diminish over time (Granroth-Wilding *et al*., 2017). Long-term studies on tawny owls further suggest that early-life conditions, including food availability can influence adult parasite burdens, yet do not typically result in higher intensities in adults compared to chicks. Our results present a notable exception, indicating that factors such as environmental exposure, immunity and life history may contribute to this reversal of the expected age-related pattern in parasite intensity. In addition, age, season, and the farm management all play an important role in the prevalence of the parasites in birds. Our results are consistent with the studies by the Venkatachalam research group, which result in the older birds usually harboring persistent infections, hence supporting the persistence of parasites. The nature of seasonal change with a higher prevalence in spring and a lower prevalence in winter (Valdebenito *et al*., 2024). There is also the role that management practices on farms that use open-sided systems and are more prevalent than closed systems have played in the distribution of parasites (Parsa *et al*., 2023), which affirms the role of landscape structure and anthropogenic factors. It is, however, crucial to mention the fact that such influences may be species-specific and context-specific, as indicated by (Rodrigues *et al.*, 2021). These results, when considered together, highlight the importance of the host age, the seasonality of the environment and the managerial approach in dictating the prevalence of a parasitic infection among bird populations. Also, there can be a higher mortality in highly parasitized juveniles before they attain adulthood (Sol *et a*l., 2003). On a similar note, researches on cormorant chicks and European shags has shown that, depending on the age of the birds, there is a general tendency of the younger ones to have lower means of nematode infection. Interestingly, the lowest levels of the burden of these infections are not necessarily located in adult birds meaning that infections are at times built early in life and this is interesting (Torres *et al*., 2005). Our results however are an exception to this trend. Compared to the known regularities, parasite intensity had been found to increase with age in our studied population of the chicks. In particular, the chicks were observed to have higher number of worms in old chicks than in their younger ones as reported by Torres *et al* (2005). That implies that certain predispositions like exposure to the environment, immune response are associated with the normal age dependency of parasite intensity. Overall, these observations highlight how tricky the host-parasite relationships are and how more researches will be necessary to determine the mechanics behind such trends**.**

V:Conclusion

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The current study evaluates the significance of parasitic infections that affect poultry. It is also observed that the prevalence of parasite infection is also high, up to 56.7 percent, in the poultry of Dhi Qar province, according to the epidemiological study. *Ascaridia galli* was the most dominant parasite in terms of infection rate as well as the degree of infection. Interestingly, the parasite burden increased with the age of the birds and age was proved to be a key risk factor. Seasonal influences and management conditions were also very important aspects, as more infected cases were found in spring and in birds farmed in open-sided floor-based systems than by those in closed cages. These results confirm the need to pay attention to the age structure of the host, seasonal factors and conditions under which it is raised when managing parasitic infection. The paper suggests adoption of specific control interventions that are consistent with these parameters as a way of reducing economic losses and improving the health of poultry. Also, it recommends that studies in the future be addressed to working on rapid diagnostic testing instruments, investigating sustainable control strategies and longitudinal studies to investigate parasite dynamics and response to interventions in different production systems**.**

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