Yemeni Journal of Agriculture and Veterinary Sciences
ISSN Online: ISSN 2311-7788
YJAVS- 23–01-04-06
DOI: XXXXXXXX
Available on line at: http://journal.tu.edu.ye/index.php/yjavs/index

Original Article

Gastrointestinal Parasites of Local Breeds Chicken in Dhamar City

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KEYWORDS

Chicken,
Gastrointestinal parasites,
Dhamar, Yemen

Article history

Received

28 November,2023

Accepted

25 December 2023

ABSTRACT

The study was conducted with aim to determine the gastrointestinal parasites of local breed chickens (*Gallus gallus domestica*) slaughtered in Chicken`s Market at Dhamar city localities. A total of 246 faecal samples from the gastro-intestinal tracts of slaughtered chicken were collected and examined from January to June, 2023, using direct smear and sodium chloride floatation methods for the presence eggs and oocyst of gastrointestinal tract (GIT) parasites. The results demonstrated that, out of 246 samples examined, 170 (69.11%) were found positive with one or more parasites species. High infection rate was found among males (45.53%) compared to females (23.58%). The parasites species identified were *Ascaridia galli* (21.95%), *Raillietina echinobothrida* (10.57%), *Eimeria spp*. (14.63%), *Railletina cesticillus* (9.76%), *Capillaria spp* (6.10%) and mixed infection (6.10%). Significant differences (P<0.05) were observed among prevalence rates of parasites identified. The distribution of parasites infections on the basis of risk factors/Characteristics, the higher rate was found in age groups of less than 5 months (30.89%), in *Albaladi Aljabali* breed *(*35.37%), in the month of March (17.07%) and in Anis localities (16.67); whereas, the lower infection rate was found in age group of up to 12 months (17.89%), in hybrid breeds (4.07%), in months of June (7.72%) and in Myfaa localities (10.98%). Significant differences (P<0.05) were observed between prevalence rate and sex, month variation (season) and area (localities); while, none with other factors. The results of the logistic regression analyses showed significant association between GIT parasites infection rate and sex (OR= .377; 95%Cl: 0.216-0.656; P= .001), Breeds (OR= 1.366; 95%Cl: 0.216-0.656; P= 0.024) and parasites species (OR= 0.058; 95%Cl 0.026-0.130; P= 0.000), and none with other characteristics or risk factors investigated. In conclusion, gastrointestinal parasites infections are prevalent among local chickens in study areas. An epidemiological control programme should be put in place to minimize parasite infections and their impact on local chicken production.

INTRODCTION

The poultry industry occupies an important position in the provision of animal protein (meat and egg) to man and also plays an important role in the national economy as a source of revenue (FAO, 2006). Native chickens, known as *Albaladi*, are the chicken breeding commonly rearing by people traditionally under free-range or backyard control system (Zalizar (et al., 2021) but constrained by many extrinsic factors like malnutrition, poor management and the absence of biological security which is very outstanding. In addition, predation by other animals also is effective threat to local chicken (Saidu et al., 1994; Derbie and Mebrate, 2020). The chickens are generally raised in a free-range system, scavenging around the compound of households, feeding on the locally available resources like earthworm, household refuse, insects, residue from harvest, animal and human faeces etc. (Ajala et al., 2007).

Gastrointestinal tract(GIT)parasites are considered an important problem of chicken reared in rural scavenging system and incriminated as a major cause of ill-health and loss of productivity in poultry in different parts of world (Fakae and Paul-Abiade, 2003; Ajala et al., 2007).

Nematodes, Cestodes and trematodes and protozoa are important parasites of poultry production. These parasites can be found in the intestine or fecal dropping especially when expelled as fresh specimen (Fakae and Paul-Abiade, 2003; Biu and Haddabi, 2005). These parasites are found more frequently in the warm seasons, when the intermediate hosts are abundant. Beetles and houseflies inhabiting poultry houses act as intermediate host for most species of cestodes (Baba and Oveka, 2004).

Although the prevalence of parasitic infection has been greatly reduced in the commercial production system, mostly due to improve housing, hygiene and management operations (Yoriyo et al., 2008). A large number gastrointestinal parasites are still widely distributed throughout the world in free – range chicken. Previous studies (Saidu et al. (1994) ; Ruff (1999; Yoriyo et al., 2008) reported that, 35-100% of the rural scavenging chicken examined were positive for one or more of gastrointestinal parasites.

To our best knowledge, there is no literature in combined data on prevalence of gastrointestinal parasites in Yemeni local breed at Dhamar, Yemen; therefore, this study was designed to determine the gastrointestinal parasite in local chicken breed in Dhamar city, and associated risk factors.

MATERIALS AND METHODS

Study Area

A cross-sectional study was conducted between the periods of January to June 2023 in Dhamar city, Dhamar governorate. The Dhamar governorate located to the south east of Sana'a governorate, to the north of Ibb governorate, to the east of Al Hudaydah governorate and to the north west of Al Bayda'a governorate in the central highlands of Yemen. The topography of Dhamar area varies from level plain to slopes at elevation between 2400 to 2700 meters above sea level. It`s irrigated by rainfall and underground water. According to the last Census in 2004, the total population for the governorate is about 1,330,108 which expected to be 3,311,033 in 2034. Agriculture is the main economic activity in the area. Majority of population working in Agriculture (Abbas *et al*., 2018; Al-Aizari et al., 2018).

Sample size

Since the prevalence of major GIT parasites of local chicken in Dhamar city small scale production system has not been reported, 15% expected prevalence rate was suggested with 95% confidence interval (CI) and 5% desired absolute precision following keys given by Thrusfield (2006). Therefore, the total sample was calculated using Thrusfield formula**.** $\mathbf{N= (1.96)^2 Pexp(1-Pexp)/d^2}$ **.**

Where, n= required sample size, Pexp= expected prevalence and d= desired absolute precision.

Accordingly, the required sample is 246 chicken.

Collection of Samples

A total of two hundred forty-six gastrointestinal tracts of local breed chickens slaughtered in different areas of Dhamar city were collected, labeled with necessary information, and then transferred to the Department of parasitology laboratory, Thamar University for processing and examination (Afia et al., 2019)**.**

Samples analysis

In laboratory, the gastrointestinal tract parts were separated and their contents emptied into their respectively labeled beakers. The contents were washed into a petri dish and examined under a microscope for eggs/cyst of gastrointestinal parasites qualitatively using direct wet and flotation techniques. The gastrointestinal worms were recovered as described by Hansen and Perry (1994) and Urquhart et al. (1996). The recovered worms were preserved in bottles containing 10 % formal-saline solution. The recovered worms were identified under light microscope by observation of their distinctive morphological features as described by Soulsby (1982) and Ashenafi and Eshetu (2004).

Statistical Analysis

Data Obtained from this study were summarized using Tables and histogram. Descriptive and other statistical analyses were performed by using SPSS version 21 for Windows. (Version 21; SPSS Inc., Chicago, IL, USA). Chi square, logistic regression and Pearson`s correlation analyses were used to examine the relationship between prevalence and characteristics/risk factors. The association is considered significant when p- value is less than 0.05 and insignificant when greater than 0.05.

Ethical Consideration

This research was approved by the Faculty of Agriculture and Veterinary medicine Authority,

Thamar University, Dhamar, before the commencement of the study.

RESULTS AND DISCUSSION

Disease is among the major constraint of poultry production industry (Hunduma et al., 2010). The common internal parasitic infections occur in poultry include gastrointestinal helminths (cestodes, nematodes) and protozoal parasites such as *Eimmeria* species) that cause considerable damages and great economic losses to the poultry industry in the term of malnutrition, decreased feed conversion ratio, weight loss, lowered egg production and death particularly in young birds (Puttalakshmamma, 2008). Furthermore, parasites can make the flock less resistant to diseases and exacerbate existing disease conditions (Gary and Richard, 2012; Katoch *et al.*, 2012; Belete, 2016). This study aimed to determine the prevalence rate and associated risk factors of gastrointestinal parasites in free-range local chicken in Dhamar, Yemen.

The prevalence rate of gastrointestinal parasitic infection among local chickens selected and examined between January and June, 2023 in Dhamar is presented in Table 1. The results showed that out of 246 chickens examined, 170 were found infected with one or more parasite species with overall prevalence of 69.11%. These results are in agreement with findings of Asumang et al., (2019) and lower than rate reported by Negbenebor and Ali (2018) and Afia et al. (2019) in Nigeria, and higher than rate reported by Jegede et al. (2016). The consistent and contrary between results of this study and findings of above workers could be attributed to the differences in the management system, control practice in farms, and seasonal differences in the study area (Jegede et al., 2007). In addition, the high prevalence observed in local chickens is believed to be associated with the free-range nature of the local birds which roam from place to place in search of food by scavenging on superficial layer of the soil which contains various arthropods and earthworms that serve as the intermediate hosts for most helminths of Poultry (Idika, et al., 2016).

The study`s results revealed that, nematodes, cestodes and coccidia spp. were the most common intestinal parasites of chickens. These results are in accordance with the works of Luka and Ndams,(2007) in Zaria, Junaidu et al., (2014) in Nigeria, and Kumar et al. (2015) in India, who reported that, cestodes and nematodes were implicated as the major cause of helminth infection in domestic chickens**.** Cestodes generally undergo an indirect mode of transmission where they make use of intermediate host such as ants, grasshoppers, and beetles to perpetuate their transmission (Asumang et a., 2019). These organisms serve as food for scavenging birds and hence transmit the infective stage of the parasites to the bird upon ingestion (Idika, et al., 2016). The high prevalence rate of gastrointestinal infection also indicates the availability of their infective stages in the study area and the ability of the infective stages to withstand environmental conditions for a long time before they are taken in by the host (Asumang et al., 2019).

Among 170 (69.11%) infected birds with gastrointestinal parasites, the prevalence rate according to species identified was 21.95%, 14.63%,10.57%, 9.76%, 6.10% and 6.10 for *Ascaridia galli*, and *Eimeria spp*., *Raillietina echinobothrida, Railletina cesticillus, Capillaria spp*. and mixed infection respectively (Table 1). Significant differences ($P<0.05$) were observed among prevalence rates of parasites species. On the basis of parasites types, among nematodes parasites *A. galli* (21.95%, %) and in cestodes, *Raillietina echinobothrida*. (10.57%) were the most prevalent parasites species. These results are in line with previous studies (Jegede et al., 2015; Negbenebor and Ali, 2018; Asumang et al., 2019; Saraiva et al., 2020**).** The higher prevalence of *A. galli* parasite in local chicken is in consonance with several studies which indicate the species as the commonest and most important helminth infection of poultry (Cervantes-Rivera et al., 2006; Ohaeri and Okwum, 2013). This is not surprising as *A. galli* have a direct life cycle and their eggs are very resistant to the environment conditions. The eggs are passed out in the faces of the host and develop into the infective stage in the open, contaminating feed and water source, and a new hosts become infected when they ingest the infective eggs from these sources **(**Ybañez et al., 2018**).** In the deep litter system, the eggs can probably remain infective for long period depending on management practice, the temperature, humidity, pH, and ammonium concentration, feed and water sources of birds can easily be contaminated, as farm handlers can transport the eggs of these parasites from other sources to the locality of birds (Asumang et al., 2019).

The infection rate in chicken with cestoda was 20.33% out of all infected birds and was represented by *Raillietina echinobothrida* and *Railletina cesticillus*. *Raillietina* genus and these species are reported in many parts of the world with different rate of infection (Iqbal et al. 2018). Species of *Raillietina need* intermediate hosts (gastropod mollusk and ants) to complete their life cycle.

Therefore, the differences in prevalence rate can be influenced the availability of intermediate hosts, hygiene and local climate (Iqbal et al., 2018).

Eimeria spp. are one of the most important protozoan parasites of poultry, both in terms of distribution, frequency, and economic losses (McDougald, 1997). They are passed through a chicken's droppings and contaminated the environment. The common clinical signs of coccidiosis in birds are loss of appetite, blood or mucus in the feces, diarrhea, dehydration, and even death (Allen et al., 2002). Local chicken are vulnerable to the transmission of this parasite through the transportation of personnel and equipment (McDougald, 1997). However, the prevalence of most of the parasitic diseases in poultry including *Eimeria spp* seems to have reduced significantly in commercial poultry production systems due to improved housing, hygiene and management (Permin and Hansen 1998) but, its continue to be of great importance in deep-litter and free-range systems of poultry rearing (Kumar et al., 2015). In current study, the prevalence rate *Eimeria spp* infections in local chicken was 14.63%. These results are in line with findings of Negbenebor and Ali (2018) who studied prevalence of gastro-intestinal parasites of local chickens (*Gallus Gallus Domestica*) in Kano, Nigeria and reached to similar results. The prevalent *Eimeria spp* infection among local chicken may be due to seasonal variations, management practices, biosecurity, and ecological conditions of the study areas.

In mixed infection, Out of total 246 chickens examined, 15 (6.1%) birds were found infected with more than one parasites, this prevalence rate is lower than findings reported by Jegede (2015) who reported higher percentage of mixed infection in local birds in Nigeria. This could be attributed to managemental practices, breeds and size of samples examined. Moreover, Afia et al. (2019) suggested that**,** the mixed infection of two or more species of parasites per bird could be due to food preference at a particular time.

The effect of characteristic/ risk factors on distribution of gastrointestinal parasites prevalence in local chicken are presented in Table 2. As shown, the higher rate of infection was recorded in bird of age group less than 5 months (30.39%); whereas, lower infection rate(17.89%) in birds of age group up to 12 months. There were no significant differences ($P<0.05$) between prevalence rate and age factor. These results are in contrast with findings of Jegede et al. (2015) who reported that there were significant differences ($p<0.05$) among the age groups, with highest infection rate occurring in grower birds. This could be attributed to the existing maternal immunity in the chicks and the longer exposure of the older birds to both helminth ova and coccidian oocyst from the environment.

On the basis of sex, the results revealed that, the infection rate in males (45.53%) was significantly ($P<0.05$) higher than females (23.58%) as depicted in Table 2. These results are in accordance with findings of Jegede et al. (2015) and in contrary with findings of Uhuo et al. (2013) who reported that the infection rate in females higher compared to males. The higher prevalence rate of infection in males may be attributed to behavior and biological factors.

In Yemen, there are two breeds of indigenous chicken. One of them is called *"Albaladi Aljabali"* and is located in the high mountains and uplands. The second breed is called *"Albaladi Alsahili*" which is located in the lowland coastal areas (Al-Mamari, 2008). In this study, the gastrointestinal parasites were more prevalent in *Albaladi Aljabali*(35.37%) compared to *Albaladi Alsahili* (16.67%) and Hybrid breeds (4.07%). Statistically, there were no significant differences ($P > 0.05$) in prevalence rate of infection among local breed chicken examined (Table 2). These results are in parallel with findings of Zalizar et al., (2021) who studied prevalence of gastrointestinal helminths in Indonesian native chickens, and its impact on egg production. The differences in prevalence rate in Yemeni chicken breeds may be due to genetical and environmental factors.

In present study, Month variation (season) was significantly ($P<0.05$) effect on distribution of parasites in local chicken, and the higher prevalence rate of infection was recorded in month of March (17.07%) and the lower rate in month of January (9.76%) as indicated in Table 2. These variations could be due to differences in local environmental conditions, which support larval development and facilitate transmission of infective stage to new host. The impact of geographical zone in distribution of gastrointestinal parasites also was investigated, and the results were revealed that, the higher the prevalence rate of GIT parasites in chicken was recorded in Anis and Dhamar city(16.67%); whereas; the lower rate in Myfaa area (10.93). There were significant differences ($P > 0.05$) in prevalence rate of infection among study localities/areas. The reason behind that could be attributed to geographical characteristics of areas, availability of intermediate hosts.

The results of logistic regression analysis for assessing the association between prevalence rate of gastrointestinal and risk factors in local chicken are presented in Table 3. As shown, logistic regression demonstrated that there association between prevalence rate and sex (OR= .377; 95%Cl: .216-.656; P= .001), Breed (OR= 1.366; 95%Cl: .216-.656; P= 0.024) and parasite species (OR= 0.058; 95%Cl.026-.130; P= 0.000); while, none with other risk factors investigated.

The correlation between infection prevalence rate, season and climatic conditions are presented in Fig. 1. As shown there is slightly fluctuation in prevalence rates and the higher rate recorded in month of March and April when climatic condition is moderate (21.5 and 21.5℃), (53 and 53%) and (49.4 and 186.9 mm) for Temperature, Relative humidity and rainfall respectively.

CONCLUSION

It could be concluded from this study, gastrointestinal parasites infections are prevalent among local breed chickens in study areas. Prevalence rate of gastrointestinal parasites infections is influenced by sex, breed of chicken, seasons (month variation) and study area. An epidemiological control programme should be put in place to minimize worm infections and their effects on local chicken. Further studies on the prevalence of gastrointestinal parasites in chicken need to be elucidated for improved intensive egg and poultry meat productions.

Table. 1. Prevalence of gastrointestinal parasites identified in local breeds chicken in Dhamar city(n=246)

Parasite	No. of birds infected	Prevalence %	*P* value
Ascaridia galli	54	21.95	0.000
Railletina cesticillus	24	9.76	
Raillietina echinobothrida	26	10.57	
Eimeria spp.	36	14.63	
Capillaria spp.	15	6.10	
Mixed infection	15	6.10	
Overall prevalence	170	69.11	

Table 2. Distribution of gastrointestinal parasites in local breeds chicken according to characteristics of chicken and environmental factors(n=246)

Variable Factor	Categories	No. of infected birds	Prevalence%	*P* value
Age	>5months	76	30.89	0.213
	10 m	50	20.33	
	<12M	44	17.89	
Sex	Male	112	45.53	0.000
	Female	58	23.58	
Breed	*Albaladi Aljabali*	87	35.37	0.152
	Albaladi Alsahili	41	16.67	
	Hybrid breeds	10	4.07	
Month variation	January	24	9.76	0.000
	February	31	12.60	
	March	42	17.07	
	April	41	16.67	
	May	31	12.60	
	June	19	7.72	
Area/ localities	Anis	41	16.67	0.002
	Centre of Dhamar	36	14.63	
	Haran	36	14.63	
	Myfaa	27	10.98	
	Mariaa	11	12.19	
Overall prevalence		170	69.11	

Table 3. Logistic regression analysis results for association between prevalence of gastrointestinal parasite in chicken and associated risk factors(n=246)

Variable/ Factor	Categories	Infected birds	Prevalence %	OR	95% Cl	*P* value
Age	>5months	76	30.89	1.32	.950-1.837	.098
	10 m	50	20.33			
	<12M	44	17.89			
Sex	Male	112	45.53	.377	.216-.656	.001
	Female	58	23.58			
Breed	*Albaladi Aljabali*	87	35.37	1.366		0.024
	Albaladi Alsahili	41	16.67			
	Hybrid breeds	10	4.07			
Month variation	January	24	9.76	1.151	.972-1.362	0.102
	February	31	12.60			
	March	42	17.07			
	April	41	16.67			
	May	31	12.60			
	June	19	7.72			
Area/ localities	Anis	41	16.67	1.094	.936-1.279	0.260
	Centre of Dhamar	36	14.63			
	Haran	36	14.63			
	Myfaa	27	10.98			
	Mariaa	11	12.19			
Parasite species						
	Ascaridia galli	54	21.95	0.058	.026-.130	0.000
	Railletina cesticillus	24	9.76			
	Raillietina echinobothrida	26	10.57			
	Eimeria spp.	36	14.63			
	Capillaria spp.	15	6.10			
	Mixed infections	15	6.10			

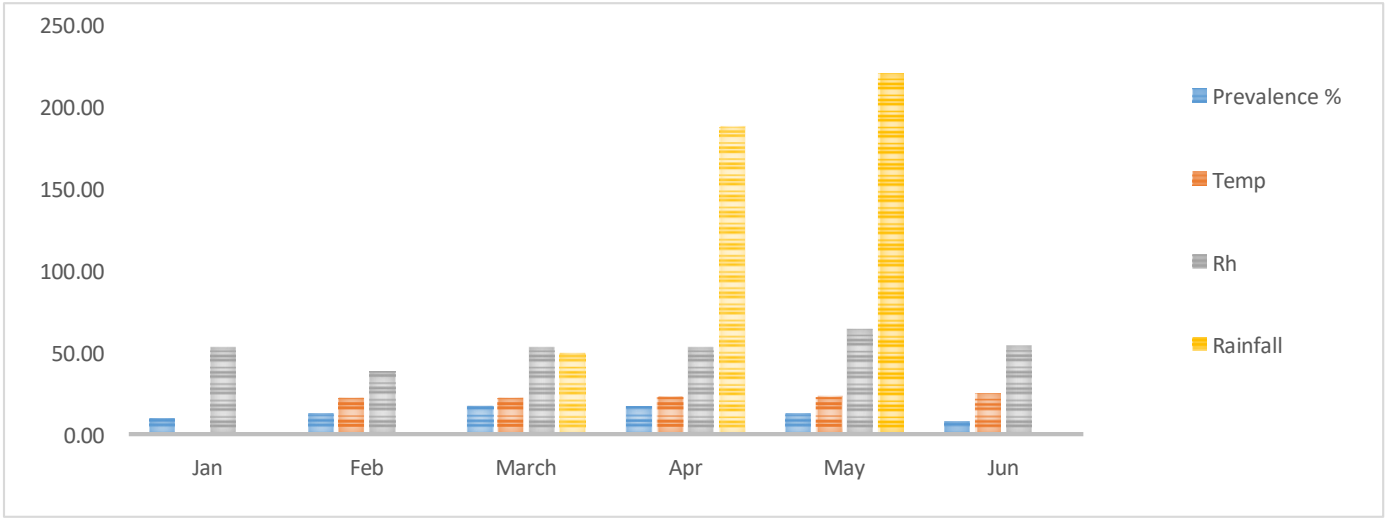

Fig.2. Correlation between parasites prevalence and season and weather in local chicken in study areas

ETHICAL APPROVAL

This study was conducted after approval by Faculty of Agriculture & Veterinary Medicine, Dhamar University, Yemen.

ACKNOWLEDGMENT

The Authors would like to thank owner`s poultry and butches in different market localities at Dhamar governorate, for their cooperation extended to us during this study. The assistance offered by our students, in particular, Mukhtar abdo rashid al-Faqih, Ali Saad Saleh Al-Ahsami, Ali Mohammed Ali Al-Faqih, Waseem Nezar Fasil Al-Ghabiry is gratefully acknowledged.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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ديدان القناة الهضمية في السلالات المحلية للدجاج في مدينة ذمار

الملخص

أجريت هذه الدراسة بهدف التعرف على الطفيليات المعوية التى تتطفل على الدجاج المحلي التى يتم ذبحها في اسواق الدجاج بمدينة ذمار وتحديد نسبتها .تم جمع وفحص ما مجموعه 246 عينة براز من القناة الهضمية للدجاج المذبوح في الفترة من يناير إلى يونيو 2023، باستخدام طرق المسحة المباشرة والتعويم (كلوريد الصوديوم) للبحث عن وجود بيوض ومتكيسات الطفيليات في الجهاز الهضمي للدجاج المفحوص، كشفت النتائج أنه من 246 عينة تم فحصها، 170 (69.11%) وجدت إيجابية لاحدى أو أكثر من أنواع من الطفيليات، وكانت نسبة الإصابة مرتفعة بين الذكور (45.53%) مقارنة بالإناث (23.58%). أنواع الطفيليات التي تم التعرف عليها هي: (21.95%) *Ascaridia Galli*، *Raillietina echinobothrida* (10.57%)، (14.63%) *Eimeria spp*.، (9.76%) *Railletina ceticillus*، (6.10%) *Capillaria spp*، والعدوى المختلطة (6.10%) ، لوحظت فروق معنوية(P<0.05) بين معدلات انتشار الطفيليات التي تم التعرف عليها. كما اظهرت النتائج ايضا ان توزع الإصابة بالطفيليات على أساس عوامل الخطورة، ان أعلى نسبة اصابة وجدت فى الفئات العمرية أقل من 5 أشهر (30.89%)، فى سلالة البلدي الجبالى (35.37%)، فى شهر مارس (17.07%) ، وفي مديرية انس (16.67)؛ بينما سجلت أقل نسبة إصابة في الفئة العمرية حتى 12 شهر (17.89%)، في السلالات الهجينة (4.07%)، في أشهر يونيو (7.72%)، وفي مديرية ميفع(10.98%). لوحظت فروق معنوية ذات دلالة إحصائية (P <0.05) بين معدل الانتشار والجنس واختلاف الشهور (الموسم) والمنطقة (المديريات) مع نسبة الاصابة؛ بينما لم يلاحظ مع بقية عوامل الاخرى .أظهرت نتائج تحليلات الانحدار اللوجستي وجود ارتباط كبير بين نسبة الإصابة بطفيليات الجهاز الهضمي والجنس (OR = 0.377 ؛ 95%Cl: 0.216-0.65695؛ P = 0.001) ، والسلالات (OR = 1.366 ؛ 95 .(95%Cl: 0.216-0.656؛ (P = 0.024)، وأنواع الطفيليات (OR = 0.058 ؛ 95٪ CI 0.026-0.130؛ P = 0.000). نستنتج من هذه الدراسة أن الإصابة بالطفيليات المعوية منتشرة بين الدجاج المحلى فى مناطق الدراسة. لذا يجب وضع برنامج مكافحة وبائي للحد من الإصابة بالطفيليات وتأثيرها على إنتاج الدجاج في منطقة الدراسة والبلد بشكل عام.

الكلمات المفتاحية: **الدجاج، طفيليات القناة الهضمية، ذمار، اليمن**

To cite this article: AlShaibani IRMS, HHA Al-AHsami, Z G Al-Nhari. 2023. Gastrointestinal Parasites of Local Breeds Chicken in Dhamar City.Yemeni Journal of Agriculture and Veterinary Sciences; 2(2):1-9.