Original Article

Sahel Journal of Veterinary Sciences

Article History
Received: 06-12-2025
Revised: 11-12-2025
Accepted: 15-04-2026
Published: 30-04-2026

Sahel J. Vet. Sci. Vol. 23, No. 1, Pp 23-27 (2026)
https://doi.org/10.54058/jyqt3773

Prevalence of Gastrointestinal Helminths in Chickens Slaughtered at Biu Main Market, Borno State, Nigeria

[1*]Usman, A. M., [2]Zira, J. D., [3]Omar, A. A. and [2]Vilita, Z. D.

[1]Environmental Health Science Department, Federal University of Health Sciences, Azare, Bauchi State
[2]Biological Science Department, Nigerian Army University Biu, Borno State
[3]Department of Science Laboratory Technology, Sa'adu Zungur University, Bauchi State

[*] *Author for Correspondence: usman.alhajimohammed55@gmail.com*

ABSTRACT

Chicken remains the most intensively reared domesticated poultry species in the animal production industry in Africa. A cross-sectional study was conducted from July-November, 2024 in Biu Local Government, Borno State Nigeria to investigate the prevalence and risk factors associated with helminth infections in chickens slaughtered within the study area. A total of 384 samples were collected and examined for gastrointestinal parasites using the flotation technique. The overall prevalence of 172 (44.8%) was observed and female chickens were more infected 105 (61%) than male 67(34.9%). Local breed were more infected 129 (67.1%) than exotic 43 (22.4%) and adult chickens were more infected 137(56%) than the young chicken 35(25.5%).The difference in prevalence rate between different sexes, breed and age of the chickens were statistically significant $p<0.05$.Five (5) nematodes species *Ascaridia galli* (67%), *Heterakis gallinarum* (12%) *Capillaria* spp (9%) and *Syngamus trachea* (5%), *Strongyloides avium* (4%) and two (2) cestodes species *Choanotaenia infundibulum* (2%) and *Raillietina* spp (1%) were found in both local and exotic. The study revealed a moderate prevalence of gastrointestinal helminth in the chickens slaughtered in the study area, therefore there is need for educating the farmers on the risk of gastrointestinal helminths infections on their chickens and the important of good management practices such as strategic deworming programs, improved hygiene and sanitations, better management practice as well as regular veterinary monitoring that will boost their productivity and welfare.

Keyword: Biu; Gastrointestinal Helminths; Chickens; Prevalence; Market; Slaughter

INTRODUCTION

In most developing countries, chickens are the most vital species of poultry and investment in poultry is significant across Nigeria (Zahradeen, *et al.,* 2010). In Nigeria, most poultry farmers focus on rearing chickens and Turkeys, with chicken being the most preferred. About 85 million (42%) of Nigeria's population, 4 in every 10 Nigerian, are into poultry production, primarily small scale to medium scale poultry farming. (PAN, 2017). High interest in chicken production is attributed to the low cost of production as compared to other domestic animals and also the lack of traditional and clerical forbiddance in poultry in both developed and developing countries of the world (Lawal *et al.,* 2016).

About 21 billion eggs are produced in Nigeria annually through poultry farming, making it the largest producer of chicken eggs in Africa. However, compared to other countries, Nigeria's chicken egg consumption is 60 eggs per annum per capita, compared to 250 eggs per annum per capita in advanced countries (PAN, 2017). Poultry production in Nigeria amounts up to 300 Metric tons of meat and 650 Metric ton of eggs per year and about 85 million Nigerians are involved in poultry production (many on a small to medium scale). In the extensive/free-range/backyard system, it comprises nearly half of the chicken population and flock sizes may reach up to 50 birds. Their production is subsistence-oriented, mainly for family consumption with low levels of egg productivity and the flock includes birds of different indigenous species and varying ages PAN (2017)

The challenge of gastrointestinal parasites significantly impacts poultry production in Africa, often underestimated by farmers despite its role in causing health issues and high mortality rates in the poultry sector (Inuwa *et al.,*2023). Gastrointestinal helminthiasis is caused by roundworms (nematodes), tapeworms (cestodes), and flukes (trematodes) (Afolabi *et al*., 2016; Ola-Fadunsin, 2019). With respect to the health impact of the infection, the abundance of pathogenic helminth species, and the economic importance, nematodes are the most important intestinal worms in the poultry industry (Ngongeh *et al.,* 2014; Ola-Fadunsin *et al*., 2019). Impacts associated with nematode infections include reduced health, welfare, and production performance due to reduced feed conversion ratio, reduced growth rates, weight loss, reduced egg production and egg quality, intestinal damage, and in severe cases, death (Sreedevi *et al*., 2016). Nematode infections can have direct adverse effects on the host, inducing the breakdown of the gastrointestinal barrier, but indirect damage can also occur via increased susceptibility to secondary infectious diseases (Sharma *et al*., 2019) and reduced host immune response (Pleidrup *et al*., 2014; Dalgaarda *et al*., 2015).

Gastrointestinal helminths have been incriminated as a major cause of ill-health and loss of productivity through decreased feed conversion ratio, reduced weight gain and weight loss in broilers, poor egg lay in layers, and mortalities (Ngongeh *et al.,* 2014; Afolabi *et al*., 2016; Ola-Fadunsin 2019). Investigating the prevalence and risk factors associated with gastrointestinal infections in chickens can provide essential data to guide in development of targeted and efficient control strategies, which is vital for improving the overall health and productivity of quality chicken. To the best of our knowledge this information is limited in this area. This study aimed to determine the prevalence and species composition of gastrointestinal helminths in chickens slaughtered at Biu Main Market, Borno State, Nigeria, and to assess selected host-related risk factors associated with infection.

MATERIALS AND METHODS

Study Area

Biu is a town and a Local Government Area (LGA) in southern Borno State of Nigeria. The town lies at coordinates 10°36′40″N 12°11′42″E. The local government area falls within the Northern Guinea savannah and the Sudan savannah regions (Kparmwang *et al*, 1994) and has a semi-arid climate with average temperature of 32°C. The area exhibits two distinct seasons dry and rainy and spans a landmass of about 3,423.86 km2. The recorded human population stands at 175,760, according to the 2006 census (NPC, 2006). The predominant climate elements influencing the study area's climate and impacting the farming system are temperature and precipitation (rainfall). Biu experiences its highest precipitation levels in July, August, and September, with an average of 23 rainy days and 164 mm (6.5 inches) of precipitation per month (Britannica, 2009)

Sampling method and Sampling collection

Random sampling method was used to select the study animals, and fecal samples were collected aseptically from all selected chickens immediately after slaughtered in Biu main market. The samples collected were transferred in an ice-cooled container to Biology Lab, Faculty of Natural and Applied Science, Nigerian Army University Biu for parasitological analysis. The samples collected were properly labeled sex (male or female), breed (local or exotic) and age (young or adult). 24 samples were collected randomly every week for a period of 16 weeks from July to October, 2024.

Sample Size Determination

Since the total number of chickens slaughtered in Biu LGA is unknown, the population size is going to be labeled unknown, the confidence interval was taken as 5% and a confidence level of 95% was used with a standard deviation of 0.5. The sample size was determined using the Andrew Fisher's formula recommended by Getachew *et al.* (2017) a constant z-score value of 1.96, for 95% confidence level will be used.

$$N = \frac{Z^2 \times P_{exp}(1 - P_{exp})}{d^2}$$

$$N = \frac{1.96^2 \times P_{exp}(1 - P_{exp})}{d^2}$$

Where:

- **n** = required sample size
- **Z** = standard normal deviation (1.96 for 95% CI)
- **P** = expected prevalence (0.5 when unknown)
- **d** = desired precision (0.05)

$$\text{Sample size} \quad \frac{(1.96)^2 \text{ x } 0.\text{-}5 \text{ x } (1\text{-}0.5)}{(0.05)^2}$$

Sample size 384

Laboratory Analysis

Preparation of Flotation Solution

The flotation solution used was sodium chloride solution. 400g of sodium chloride was dissolved in 500mL boiling water until super-saturation and then allowed the solution to cool-down and the solution as filtered as described by Krishi (2015).

Fecal Analysis

The faecal samples were collected from the rectum of each study bird with a spatula which was thoroughly washed and wiped after each collection to avoid cross contamination. Each faecal sample was put into a clean labeled sampling bottle, the label indicated the sex, age and breed of the chickens and sample collection date. In the laboratory, all faecal samples were examined using simple flotation technique (Soulsby (1982). However, overfilling was avoided to avoid loss of floated materials. A clean glass slide was placed on the test tube and left for 25-30 minutes. The slide was then removed and a cover slip was placed on the area containing the eggs/cysts. Slides were examined with the light microscope using X40 magnification. Identification of the eggs was done based on their characteristic morphology (Bliss and Kvasnicka, 1997).

Data Analysis

The data collected were subjected to chi-square tests to compare the relationship between the variables and descriptive statistical analysis to determine the prevalence rate. All data analysis was done using Microsoft excel version 10.0 and $p<0.05$ was used to determine the level of significance.

RESULTS

This study reveals an overall prevalence of 44.8% and female chickens had a higher prevalence rate of 61% than male with 34.9%. The difference in prevalence rate between different sexes of the chickens were statistically significant $p<0.05$ Table 1. Adult chicken has the highest prevalence rate of 56% than the young ones with25.5%. The difference in prevalence rate between different age groups of chickens were statistically significant $p<0.05$ Table 2. Local breed has the highest prevalence rate of 67.1% than the exotic breed 22.4%. The difference in prevalence rate between different breed of the chickens were statistically significant $p<0.05$ Table 3. Seven (7) helminths species were recorded in this study; five (5) nematodes *Ascaridia galli* (67%), *Heterakis gallin arum* (12%) *Capillaria* spp (9%) and *Syngamus trachea* (5%), *Strongyloides avium* (4%) and two (2) cestodes *Choanotaenia infundibulum* (2%) and *Raillietina* spp (1%) were found to occur in both local and exotic chicken as in Table 4.

Table 1: Prevalence of Gastrointestinal Parasites Based on Sex of Chickens in Biu, Borno State

Sex	Number Examined	Number Infected	Prevalence (%)	Chi-square (χ^2)
Males	192	67	34.9	
Females	192	105	61	15.21
Total	**384**	**172**	**44.8**	

Table 2: Prevalence of Gastrointestinal Parasites Based on Age of Chickens in Biu, Borno State, Nigeria

Age	Number Examined	Number Infected	Prevalence (%)	Chi-square (χ^2)
Adult	243	137	56	
Young	141	35	25.5	35.93
Total	**384**	**172**	**44.8**	

Table 3: Prevalence of Gastrointestinal Parasites Based on Breed of Chickens in Biu, Borno Stat, Nigeria

Breed	Number Examined	Number Infected	Prevalence (%)	Chi-square (χ^2)
Local	192	129	67.1	
Exotic	192	43	22.4	77.8
Total	384	**172**	**44.8**	

Table 4: Prevalence of Gastrointestinal Helminths Species Encountered among Infected Chickens in Biu, Borno State, Nigeria

Helminths Species	Number of Helminths Encountered	Prevalence (%)
Ascaridiagalli	116	67
Heterakis gallinarium	20	12
Capillaria spp.	15	9
Syngamus trachea	9	5
Strongyloides avium	7	4
Choanotaenia infundibulum	3	2
Raillietina spp.	2	1
Total	**172**	**100.0**

DISCUSSION

In the current study, the overall prevalence of gastrointestinal helminths observed was 44.8%. In comparison, existing studies on poultry helminths in Nigeria suggest that the prevalence of gastrointestinal helminths ranges from 16.7% (Ola-Fadunsin *et al.,* 2019) to 100% (Uhuo *et al*., 2013) among chickens from Kwara and Ebonyi States, respectively. The moderate prevalence observed in this study may be attributing to factors, such as control measures, geographical location, parasitological detection methods, rearing system, chickens breed and sample sizes among others. Ayeh-Kumi *et al.* (2016) reported the difference in prevalence could also be related to the difference in management system, study method, sample size and control practice in the different countries. In other part of the African countries Asumang *et al*. (2019), in Ghana reported 65.5% and Berhe *et al*. (2019) in Ethiopia reported 90.6% in similar studies reported these reasons as the causes of the different in prevalence.

Female chickens were more infected 105 (61%) than male 67(35%). The difference in prevalence rate between different sexes of the chickens was statistically significant $p<0.05$. Female chickens are often kept for longer periods for breeding purposes. Thus, they are continuously exposed to helminths. Male chickens are often kept for shorter periods and are usually sold out during the festival season because there are more expensive and bigger in size. Also, Naqvi *et al*. (2017) reported that female chickens have higher levels of prolactin and progesterone that inhibit the immune system, making them more susceptible to parasitic infections. This finding agreed with the earlier finding of Uhuo *et al.* (2013) and Opara *et al.* (2014) who recorded a rather higher infection rate in female chickens Ebonyi state and southeastern state respectively.

Local breed showed a higher prevalence 129 (67.1%) than exotic 43 (22.4%). The difference in prevalence rate between different breed of the chickens were statistically significant $p<0.05$. This agrees with previous reports by Agbolade *et al*. (2014); Idika *et al.* (2016) and Usman, *et al.,* (2022). This is possible because it usually depends on the system used in rearing the chickens, higher stocking densities and supply their other need or not, allowing to scavenge for survival, irregular vaccination as well as poor maintenance of good hygienic practice and most of the local breed in this study area are rear using free range or extensive system which exposed them more than the exotic breed that are usually rear using intensive system. This also

corroborated with Beyene *et al.* (2014) and Shiferaw *et al.* (2016).

Adult chickens were more infected 137(56%) than the young chicken 35(25.5%) than young. The difference in prevalence rate between different sexes, breed and age of the chickens were statistically significant $p<0.05$. This finding agreed with the earlier studies of Usman, *et al.* (2022), Lawal *et al.* (2023) and Gambo *et al.* (2024) both in Borno state but contrast to that of Dauda *et al.* (2016) in Jos, Plateau state. This could be linked to the fact that as they grow, chicken is increasingly exposed to helminths and our major method of managing system (semi-intensive). Chapman *et al*. (2005) reported it could be associated with the immature immune system in young chickens leaving them susceptible to infection.

A total of seven (7) helminths species were recorded in this study; five (5) nematodes *Ascaridia galli* (67%), *Heterakis gallinarum* (12%) *Capillaria* spp (9%) and *Syngamus trachea* (5%), *Strongyloides avium* (4%) and two (2) cestodes *Choanotaenia infundibulum* (2%) and *Raillietina* spp (1%) were found to occur in both local and exotic chickens. All these species were been reported in different studied and nematodes are the most prevalent parasites of domestic chicken (Agbolade *et al.,* 2019*:* Lawal *et al.,* 2023). High parasitic infections may be attributed to the poor handling and control efforts in either the animal or in the immediate environment where infection or re-infection may come from (Adang *et al*., 2014).

Similarly, there was total absence of trematode species in this study which collaborate with the earlier studied of Junaidu, *et al.* (2014) and Gambo *et al.* (2024). The absence of lakes and other water bodies lead to reduction of the intermediate host number in the present study area which might be the reason for the absence of trematodes. Also, the absence of these worms could be explained by the complex nature of their life cycle involving a freshwater snail as an intermediate host (Junaidu, *et al.,* 2014).

Conclusion

The overall prevalence of 44.8% of gastrointestinal helminths observed among chickens slaughtered in study area. Breed, age and sex appear to be risk factors associated with the incidence of these parasites. The study reveals moderate prevalence of gastrointestinal helminths species in chickens slaughtered in the study area, therefore there is need for educating the farmers on the risk of gastrointestinal helminths infections on their chickens and the important of good management practices such as strategic deworming programs, improved hygiene and sanitations, better management practice as well as regular veterinary monitoring that will boost their productivity and welfare

Acknowledgment

The authors wish to thank Mr. Mohammed Haruna of Biology Laboratory, Faculty of Natural and Applied Sciences, Nigerian Army University Biu for his technical assistance during the laboratory analysis of this research work.

Conflict of Interests

The authors declare that there is no conflict of interest.

Authors Contribution

UAM, designed the study and wrote the manuscript, VZD collected the samples for the study and analyzed it in the laboratory, ZJD, analyzed the data statistically and OAA, reviewed the manuscript. All authors reviewed and approved the final draft before submission.

REFERENCES

Adang, K.L., Asher, R. and Abba, R. (2014). Gastro-intestinal helminths of domestic chickens *Gallus gallus domestica* and ducks *Anasplatyrhynchos* slaughtered at Gombe main market, Gombe State, Nigeria. *Asian J. Poult. Sci.*, 8: 32-40.

Afolabi, O.J., Simon-Oke, I.A. and Olasunkanmi, A.O. (2016). Intestinal parasites of domestic chicken (*Gallus gallus domesticus*) in Akure, Nigeria. *J. Biomed*., 1(4): 1-4.

Agbolade, O.M., Arosoye, A.S., Akajiugo, E.C., Akinyemi, H.A., Owolowo, A.M., Ariba, O. and Jonathan, K.A. (2014). Gastrointestinal parasites of domestic fowls from Ijebu North, Southwestern Nigeria. *Basic Res. J. Agric. Sci. Rev.*, 3(7): 60-64.

Agbolade, O. M., Oladunni, N.A., Wunmi, A. A., Joseph, A. A., and Anuoluwapo, D. (2019). Gastrointestinal Helminths of Local and Exotic Domestic Fowls in Ijebu-Ode, Ogun State, *Nigerian J. Anim Res*: .9 (1) p. 19-25. DOI: 10.30954/2277-940X.01.2019.3

Asumang P., Delali J.A., Wiafe F., Kamil Z., Balali G.I., Gobe V.A.D. and Siaw W.N. (2019). Prevalence of gastrointestinal Parasites in local and exotic breeds of chickens in Pankrono–Kumasi, Ghana. *Hindawi J. Parasitol Res,* ID: 5746515

Ayeh-Kumi, P.F., Larbie, N.G., Michael, O.T. and Forson, O.A. (2016). Prevalence of gastrointestinal parasites in chickens sold in some major markets in Greater Accra, Ghana. *Int. J. Poult. Sci* 15, 335-342. https://doi.org/10.3923/ijps.2016.335.342

Beyene, K., Bogale, B. and Chanie. M. (2014). Study on effects and occurrence of nematodes in local and exotic chickens in and around Bahir Dar northwest Ethiopia. *Am-Euras. J. Sci. Res.,* 9(3): 62-66.

Berhe M., Mekibi B., Bsrat A. and Atsbaha G., (2019). Gastrointestinal helminth parasites of chicken under different management system in Mekelle Town, Tigray Region, Ethiopia. *J. Vet. Med.*, ID: 1307582, doi: 10.1155/2019/1307582

Biu (Nigeria). *Encyclopædia Britannica. Retrieved 2009-10-05. Traditional States of Nigeria. World Statesmen.org. Retrieved 2009-10-05.*

Bliss, D.H and Kvasnicka, W.G. (1997). The fecal examination: -a missing link in food animal practice. *The Compendium* 19(4): 104-109.

Chapman, H.D., Matsler, P.L., Muthavarapu, V.K. and Chapman, M.E. (2005). Acquisition of Immunity to *Eimeria maxima* in Newly Hatched Chickens given 100 Oocysts. *Avian Dis.* 49: 426-429.

Dauda, J., Lawal, J.R., Bello, A.M., Mustapha, M., Ndahi, J.J. and Biu, A.A. (2016). Survey on prevalence of gastrointestinal nematodes and associated risk factors in domestic turkeys (Meleagris gallopavo) slaughtered in poultry markets in Bukuru – Jos, Plateau state, Nigeria. *Int. J. Innovative Agric Bio. Res*., 4 (4),27-36.

Dalgaard T.S., Skovgaard K., Norup L.R., Pleidrup J., Permin A., Schou T.W., Vadekær D.F., et al.,

(2015). Immune gene expression in the spleen of chick-ens experimentally infected with *Ascaridia galli*. *Vet. Immunol. Immuno-Pathol.*, 164(1-2): 79–86, doi: 10.1016/j.vetimm.2015.01.003

Gambo, H.I., Mohzo, D.L., Abdulsalam, H., Luka, J. and Konto, S. S. (2024). Gross and Microscopic Changes Associated with Intestinal Parasitism of Local Scavenging Chickens in Maiduguri, Borno State, Nigeria *JoSVAS* 6(2): 81-87

Getachew M, Tesfaye R, Sisay E (2017) Prevalence and Risk Factors of Gastrointestinal Nematodes Infections in Small Ruminants in Tullo District, Western Harerghe, *Ethiopia. J Vet Sci Technol* 8: 428. Doi: 10.4172/2157-7579.1000428

Idika, I. K., Obi, C.F., Ezehi, I.O., Iheagwam, C.N., Njoku, I.N. and Nwosu, C.O. (2016). Gastrointestinal helminth parasites of local chickens from selected communities in Nsukka region of south eastern Nigeria. *J. Parasit. Dis*., 40(4): 1376–1380.

Lawal, J. R., Jajere, S. M., Ibrahim U. I., Geidam, Y. A., Gulani, A. I., Gambo M. and Benjamin U. I. (2016). Prevalence of Coccidiosis among Village and Exotic Breed of Chickens in Maiduguri, Nigeria. *Vet. World, 9*(6), 653-659. doi: 10.14202/vetworld.2016.653-659

Junaidu, H., Luka, S. and Mijinyawa, A. (2014). Prevalence of Gastrointestinal Helminth Parasites of the Domestic Fowl (*Gallus gallus domesticus*) Slaughtered in Giwa Market, Giwa Local Government, Area, *J. Nat Sci Res* 4(19) pp 120-125

Krishi S. (2015). Common Flotation Solutions. *General Veterinary Parasitology and Helmintology.* 3, 124-125.

Kparmwang, T., Esu, I.E. and Chude, V.O. (1994). Properties, Classification and Agricultural Potential of Basaltic Soils in Semi-arid Nigeria. *J. Arid Environ*. 38: 117–128.

Lawal, J.R., Jajere, S.M., Ibrahim, U.I., Biu, A.A. and Jonathan, D. (2023). Epidemiology of gastrointestinal helminths among chickens (*Gallus gallus domesticus*) from Borno State, Northeastern Nigeria: Prevalence, helminth burden and associated risk factors. *Revue d'élevageet de Médecine Vétérinaire des Pays Tropicaux,* 76, 37127.

Naqvi M.A., Khan M.K., Iqbal Z., Rizwan H.M., Khan M.N., Naqvi S.Z., Zafar A., et al. (2017). Prevalence and Associated Risk factors of Haemopa-rasites, and their Effects on Haematological Profile in Domesticated Chickens in District Layyah, Punjab, Pakistan. *Prev. Vet. Med.*, **1** (143): 49–53. Doi: 10.1016/j.prevetmed.2017.05.001

National Population Commission (NPC) (2006). Nigerian Population Census Report. National Population Commission, Abuja, 21-27.

Ngongeh, L.A., Chiejina, S.N. and Lawal, A.I. (2014). Prevalence of gastrointestinal helminth infections in slaughtered chickens reared in the Nsukka area of Enugu state, Nigeria. *IOSR J. Agric. Vet. Sci*., 7(11): 51-54.

Ola-Fadunsin S.D., Uwabujo P.I., Sanda I.M., Ganiyu I.A., Hussain K., Rabiu M., Elelu N., et al., 2019. Gastrointestinal helminths of intensively managed poultry in Kwara Central, Kwara State, Nigeria: Its diversity, prevalence, intensity, and risk factors. *Vet. World*, 12 (3): 389–396, doi: 10.14202/vet-world.2019.389-396

Opara, M.N., Osowa, D.K. and Maxwell, J.A. (2014). Blood and gastrointestinal parasites of chickens and turkeys reared in the tropical rainforest zone of southeastern Nigeria. *Open J. Vet. Med,* 4, 308-313.

PAN (2017). History of the poultry association of Nigeria. *Poultry Association of Nigeria,* Abuja. Retrieved from http://www.poultryassociationng.com/

Pleidrup J., Dalgaard T.S., Norup L.R., Permin A., Schoub T.W., Skovgaard K. and Vadekær D.F. (2014). *Ascaridia galli* infection influences the development of both humoral and cell-mediated immunity after Newcastle disease vaccination in chickens. *Vaccine*, 32 (3), 383–392.

Sharma N., Hunt P.W., Hine B.C. and Ruhnke I. (2019). The impacts of *Ascaridia galli*on performance, health, and immune responses of laying hens: new insights into an old problem. *Poult. Sci.*, 98(12): 6517–6526, doi: 10.3382/ ps/pez422

Shiferaw, S., Tamiru, F., Gizaw, A., Atalel, D., Terfa, W., Dandecha, M. and Mekibib, A. (2016). Study on prevalence of helminthes of local backyard and exotic chickens in and around ambowestshoa zone, Oromia regional state, Ethiopia. *J. Vet. Sci. Med.,* 4(2): 4.

Soulsby, E.J.L. (1982). Helminths, Arthropods and Protozoa of Domestic Animals. 7th edn Bailliere. TIndall Publishers London, pp. 809.

Sreedevi C., Jyothisree Ch., Rama Devi V., Annapurna P. and Jeyabal L. (2016). Seasonal prevalence of gastrointestinal parasites in desifow (*Gallus gallus domesticus*) in and around Gannavaram, Andhra. *J Parasit Dis* 40(3):656-61. Doi: 10.1007/s12639-014-0553-0.

Uhuo, A.C., Okafor, F.C., Odikamnoro, O.O., Onwe, C.S., Abarike, M.C. &Elom, J.N. (2013). Common gastrointestinal parasites of local chicken (*Gallus domesticus*) slaughtered in some selected eatery centres in Abakaliki, Ebonyi State: Implication for meat quality. *Int. J. Dev. Sustain., 2 (2): 1416–1422* (2), 1416-1422.

Usman, A.M., Malann, Y.D. and Babeker, E.A (2022). Prevalence of Coccidiosis among Local and Exotic Breeds of Reared Chickens in Azare Metropolis, Bauchi State Nigeria. DUJOPAS 8 (3b): 109-114 *https://dx.doi.org/10.4314/dujopas.v8i3b.11*

Zahradeen, M., Adebayo, A. A., and Ojo, J. A. (2010). Prevalence of Coccidiosis among Village and Exotic Breeds of Chickens in Nigeria *J. Vet. Med. Anim. Health.* 2(4):43-48