



Prevalence of Gastrointestinal Helminths in Domestic Chicken of Two Different Districts in Manipur, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The aim of the research is to determine the prevalence and identification of gastrointestinal helminth parasite of the chicken based on the gut necropsy as well as to the impact of the parasite load on the health status of chicken found in different locality of Thoubal and Kakching districts of Manipur. The gut sample were collected from different chicken centre and household backyard management area located in the above two different districts. The 87 gut samples were taken from chicken centre in 14 different villages namely Heirok, Wangjing, Kairenbikhok, Khongjom, Salungpham, Tekcham, Khangabok, Yairipok Charangpat, Athokpham, Pallel, Kakching, Wabagai, Hiyanglam. The examinations taken in this study are gut examination using gut necropsy. Result showed that 52.9% samples were positive for helminthiasis infection consisting of *Ascaridia* sp. (45%), *Raillintina* sp. (41.67%), *Heterakis* sp. (11.67%) and *Stronggyllidae* sp. (1.67%) out of the 14 different Location.

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Mixed infection with two or more parasites was common. *Ascaridia* sp. was found with highest prevalence of 45% and *Strongylidae* sp. was lowest prevalence with 1.67% out of the 14 location. The free-range management system of raising domestic chickens specially in the rural areas exposes the birds to diseases when scavenging for food. This research was embarked upon to conduct a survey on the gastrointestinal helminths that parasitize the intestinal tract of domestic chicken using the floatation method from Dec 2022 up to October 2024 in the parasitology laboratory, Department of Zoology, Dhanamanjuri University. The gastrointestinal tracts of 87 domestic chickens slaughtered in Thoubal and Kakching Districts of Manipur, India were examined for helminth parasites. A total of 87 birds were collected whereas 46 infected representing 52.9% of the study population. Four helminth parasites were encountered including *Raillietina* sp., *Ascaridia* sp., *Heterakis* sp. but in case of *Strongylidae* sp. only one from Heirok, Elangbam leikai from a local breed chicken called Kaonayen (local name). *Raillietina* sp. was the most abundant Cestode parasite while *Ascaridia* sp. was the most abundant nematode parasite recovered from the domestic chickens. In a single host of local breed chicken from Heirok khunou 9 helminth parasites were collected two nematodes and seven cestodes. Another interesting things is that from different regions of gastrointestinal tracts of a local breed 152 nematodes and 30 cestodes were found from a single host and the chicken was dead due to heavy infection of the helminth worms which was collected from Heirok Iaimayum leikai on 23 March 2024 which is a new findings of heavy infection. Site preferences by the parasites in the gastrointestinal tract of the birds were small intestine, large intestine and caeca. There was no statistically significant difference ($p < 0.05$) in the infection rate between sexes.

Keywords: Prevalence; gastrointestinal parasites; domestic chickens; Thoubal; Kakching; Manipur.

1. INTRODUCTION

"Poultry farming has tremendously developed in recent years and has become one of the most intensive forms of animal husbandry activities. Though the impact of parasitic diseases in farm birds reared on cage systems have diminished due to modernization in poultry farming and biosecurity measures, but farm birds maintained on deep litter system and backyard free ranging birds still remain susceptible to parasitic infection via litter droppings and scavenging habits. The common internal parasitic infections occur in poultry include cestodes, nematodes and coccidia. These worm infections may cause considerable damage and great economic loss to the poultry industry due to malnutrition, decreased feed conversion ratio, weight loss, lowered egg production and death in young birds. Improved poultry management practices were responsible for the reduction in incidence of parasitic infections. However, due to abundance of intermediate host they visit the poultry pens for carrying food material or for feeding like in beetles, ants, and houseflies which abundant on poultry litter droppings are responsible for transmission of various helminth parasites. The domestic chickens are the most numerous than any kind of poultry. They are kept for income generation particularly in the rural areas" (Hassouni & Belghyti, 2006). "The poultry industry in Nigeria offers the quickest supply of animal protein to man in form of high quality eggs

and meat and provides comparatively faster return to investment than cattle, small ruminants or pigs" (Matur et al., 2010). "Their manure is important in maintaining soil fertility and is widely used by farmers. Over the years there has been an increase in attention given to the health care of the birds by poultry farmers" (Ezenwaka et al., 2024; Akwa et al., 2021). "The greatest impediment to poultry production in Nigeria are diseases" (Lawal et al., 2001). "The domestic fowls are raised traditionally under free-range management system in villages with little or no supplementary feeding and without any veterinary care, thereby exposing them to parasitic infections" (Gary & Richard, 2012). "Parasitism ranks high among factors that serve as a threat to chickens, the presence of a few parasites do not usually cause a problem. However, large numbers can have a devastating effect on growth, egg production, and over-all health. The concentration of parasite eggs in the chickens has been attributed to limited housing and veterinary care services; the environment plays a major role in determining the severity of the infection. The chickens pick up the parasite eggs directly by ingesting contaminated feed, water, litter or by eating snails, earthworms, millipedes and other insects which can carry the eggs of the parasites" (Gary & Richard, 2012). "Helminth parasites commonly found in chickens includes Nematodes, Cestodes, and Trematodes. The Nematodes are the most important group of helminths that affect the

chickens both in terms of number and extent of damage caused to the gastrointestinal tract of the chickens. A good knowledge of the parasites of domestic chickens, species composition and predilection site is essential for prompt disease diagnosis and treatment. The scientific poultry management practices are responsible for the reduction in the incidence of parasitic infections. However, due to abundance of intermediate hosts like beetles, ants and houseflies which are commonly seen on poultry litter, droppings, feeds etc. are responsible for transmission of various helminth parasites among the flock. This study, therefore, explored the gastrointestinal parasites of the domestic chicken both local and exotic in different localities area of two districts of Manipur. The study seeks to specifically find out the prevalence and types of parasites in the gastrointestinal tract of chickens, the breed that is more prevalent to gastrointestinal parasites, and the sex of chickens that is more prevalent to gastrointestinal parasites. This study explored the gastrointestinal parasites of the domestic chicken in two different Districts of Manipur, namely Thoubal and Kakching from December 2022 to October 2024 in the department of Zoology, Parasitology laboratory, Dhanamanjuri University, which, to the best of our knowledge is being conducted in the area for the first time" (Junaidu et al. 2014).

2. MATERIALS AND METHODS

2.1 Study Area

The study was carried out in Thoubal and Kakching districts of Manipur, geographically situated between 240.12'54.702"N and 240.42'58.839"N North latitude and 930.50'9.856"E and 940.8'4.688"E East longitude. The area is located some 20 to 45 km away from Imphal district of Manipur in east direction. The average annual temperature ranges between 7.30°C to 33.20°C.

2.2 Study Animals

Chickens under intensive, semi-intensive and backyard production systems in different localities of Thoubal and Kakching districts were considered during the study. A considerable number of chickens all from the selected localities areas of Kakching and Thoubal districts of Manipur, area randomly taken from volunteer of chicken centre and households with both intensive and backyard management for postmortem step from December 2023 to

October 2024, the study was conducted in Thoubal and Kakching District Manipur. For a period of 1 year 10 month a total of 87 guts from local backyard chicken were collected from various market places throughout Thoubal and Kakching District, Manipur. After collection, the necessary information such as host factor including age and sex of chicken management factors including nature of farming, type of the feed used and flock size were recorded. The gastrointestinal tract of chicken was placed in clean dissection tray and intestine was freed from the mesentery, segments of oesophagus, gizzard, duodenum, small intestine, cecum and large intestine were separately cut and placed in separate in dissecting trays washed with clean tap water. The washed intestinal tract was scraped gently to remove any worm imbedded in the intestinal mucosa. The intestinal contents were washed several times till the clear sediment was visible. The parasites visible to the naked eye were picked up by clear hair brush and transferred to a petri dish containing normal saline (NS- 0.9%) solution. Helminth from each segment of the gastrointestinal tract were collected in separated petri dishes, fixed in AFA (Alcohol Formalin Acetic acid), preserved in 10% formalin or 70% Ethanol and for identification as per standard methods Soulsby (1982) and determination of sample size was according to the formula of Thursfield (1995).

Percentage of prevalence =

$$\frac{\text{No. of infected chicken}}{\text{Total no. of observed chicken}} \times 100$$

3. RESULTS AND DISCUSSION

In the present study 87 chickens were screened for the presence of gastrointestinal parasites. Among 87 chickens screened, 46 were found positive by gross examination of gastrointestinal tract (Fig. 1). Four helminth parasites were encountered including *Raillietina* sp., *Ascaridia* sp., *Heterakis* sp. and *Strongylidae* sp. only one from Heirok, Elangbam leikai from local breed. *Raillietina* sp. was the most abundant Cestode parasite while *Ascaridia* sp. was the most abundant nematode parasite recovered from the domestic chickens. In a single host of local breed chicken from Heirok khunou, 9 helminth parasites were collected two nematodes and seven cestodes. Another interesting thing is that from different regions of gastrointestinal tracts of a local breed 152 nematodes and 30 cestodes were found from a single host and the chicken

was dead due to heavy infection of the helminth worms which was collected from Heirok laimayum leikai on 23 Mach 2024 which is a new finding of heavy infection. Site preferences by the parasites in the gastrointestinal tract of the birds were small intestine, large intestine and caeca.

This in accordance with Raote et al., (1991) they found 71.10% positive for parasitic infection in desi fowls on intestinal examination in Akola region of Maharastra, India. Out of 71 positive desi birds, 35 (52.2%) were found positive for cestodes, 23 (34.3%) harbour nematodes and remaining 13 (18.3%) had mixed infections. The similar observations were made by Nadakal et al., 1972 who reported highest prevalence rate of cestodes followed nematodes and trematodes in desi birds. "The predilection sites of all the parasites except *Heterakis gallinarum* (*H. gallinarum*) were the small and large intestine. More parasites were recovered from the small intestine where there is abundance of semi digested food and debris which favours the establishment of the parasites" (Oniye et al., 2000). "*H. gallinarum* species were recovered in the caecum. This parasite is non- pathogenic in chickens but can serve as a vector for *Histomonas meleagridis*, a protozoan parasite that affects Turkeys, chickens and other birds" (Pinckney et al., 2008). "The prevalence of *H. gallinarum* in the current study was 47 (37.9%). *H. gallinarum* has a major effect on the health of chicken by sharing feed, thereby resulting in stunted growth and low productivity which may be related to damage to the intestinal mucosa" (Oniye et al., 2000). "Sometimes the parasite causes major irritation and inflammation to the mucosa of the chicken thus interfering with the absorption of food, it also affects the caecum by causing marked inflammation and thickening of the mucosa with petechial hemorrhages. In addition to that, *H. gallinarum* may produce nodular diarrhoea, emaciation and death" (Soulsby, 1982). "*Reillietina. tetragona* is one of the largest worms transmitted by scavenging birds through the ingestion of ants thereby causing weight loss in the chicken. *Ascaridia galli* is a large round worm that affects young birds more severely. Mild infections may go unnoticed but large numbers of worms may interfere with feed absorption thereby leading to poor growth of the chicken" (Saad et al.1989). "The Mixed infection of two or more species of parasites per bird was very common in the present study. This might be attributed to food preference at a particular time which determines the establishment of mixed or single infection in the

chicken" (Saad et al.1989; Katoch et al.2012). "Mixed infections in rural free- ranging chickens have been reported in several studies" (Luka & Ndams, 2007; Yoriyo et al., 2008; Puttalakshmama et al. 2008). "In this study, majority of chickens harbored multiple species infections which suggests that the environmental conditions due to poor sanitary conditions in Giwa are favourable to the spread of the infections and heavy worm burdens may lead to weakness thereby making the chicken to be exposed to viral and bacterial infections that may lead to high mortality, low egg production and stunted growth" (Hassani and Belghyti 2006). "The adult worms lay many eggs daily which can retain their viability for as long as 12 months and so domestic fowls are constantly picking up viable eggs from the droppings that contaminate the environment as they feed thereby predisposing them for heavy parasite burden" (Kulkarni et al. 2001). "Most of the parasites recovered in this study were restricted to the small intestine, particularly the duodenum, where there is optimum concentration of saline and glucose" (Fatihu et al., 1991). "Previous studies have shown that the preference for the small intestine by these parasites is to complement their physiological osmotic feeding nature where nutrients exist in dissolved form. The differences in the worm burden could be attributed to climate difference, availability of intermediate host, and possibly host factors such as host immunity. In this study, no significant difference ($p>0.05$) was observed in parasitic infection based on number of species. The helminthic infection is considered to be one of the most significant constraints in poultry production especially in humid tropical climatic conditions of India which favour faster propagation and development of larval stages of helminth parasites" (Matta and Ahluwalia 1981; Malhotra 1983; Kulkarni et al. 2001). The helminthic infections in backyard chickens adversely affect the successful poultry farming by causing unthriftiness, emaciation, weight loss and lowered egg production. The nematodes viz., *Ascaridia galli* and *Heterakis gallinarum* are more frequently encountered parasites and causes heavy economic loss to the poultry industry due to decreased feed conversion ratio, weight loss, lowered egg production and mortality in young birds. Both exotic and desi birds are equally susceptible even after adopting strict managerial practices. During the present study, none of the backyard chickens harboured trematode parasites. This might be due to non-availability of necessary intermediate host for trematode parasites in and around

Shimoga region. This is in accordance with the observations of Puttalakshamma et al. (2008) in desi birds of Bangalore, Baboolal et al. (2012) in broiler chickens of Trinidad and Katoch et al. (2012) in backyard chickens of Jammu.

The study revealed nematodes and cestodes as the most common intestinal parasites of chickens. This is in accordance with the works of (Luka and Ndams 2007) in Zaria, and (Junaidu et al. 2014, Luka and Ndams 2007) in which 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.

These organisms serve as food for scavenging birds and hence transmit the infective stage of the parasites to the bird upon ingestion. The high prevalence of nematodes and cestodes recorded in the local and exotic breeds gives an indication that neither breed is spared by the raid of gastrointestinal parasites in the study area. Their prevalence 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. The result indicated that there was no significant difference in prevalence between Nematode and Cestode parasites among the chickens. In the current study area, sex had no significant influence on the prevalence of the helminths in the chickens.

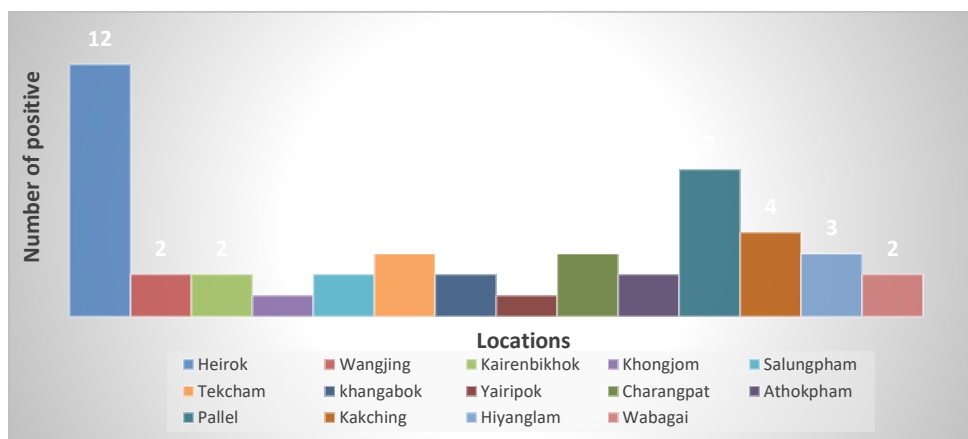


Fig. 1. Location wise prevalence of the gastrointestinal parasite infection in Thoubal and Kakching District, Manipur

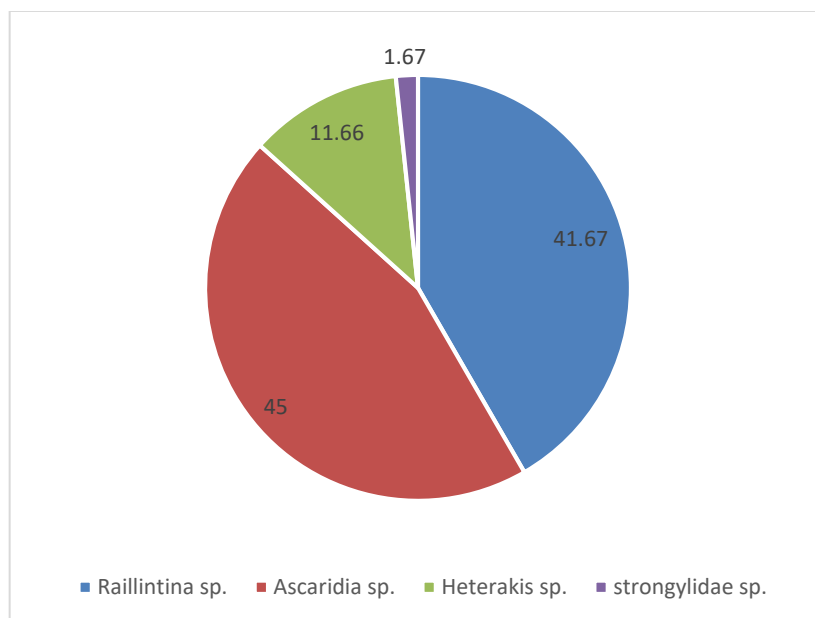


Fig. 2. Species wise prevalence (%) of helminth parasites

Table 1. Gastrointestinal helminth parasite infection of domestic chicken in Thoubal and Kakching District Manipur

SL. No.	Location	No. of sample	No. of positive	Prevalences (%)	<i>Raillintina</i> sp.	<i>Ascaridia</i> sp.	<i>Heterakis</i> sp.	<i>Strongylidae</i> sp.	No. of host infected by more-than one parasite
1	Heirok	20	12	60	9	6	2	1	3
2	Wangjing	5	2	40	2	2	0	0	1
3	Kairenbikhok	5	2	40	1	1	0	0	0
4	Khongjom	3	1	33.3	0	1	0	0	0
5	Salungpham	4	2	50	1	0	1	0	0
6	Tekcham	4	3	75	1	1	1	0	0
7	Khangabok	5	2	40	2	0	0	0	0
8	Yairipok	4	1	25	0	1	0	0	0
9	Charangpat	5	3	60	1	2	0	0	0
10	Athokpham	5	2	40	2	2	0	0	1
11	Pallel	10	7	70	2	4	1	0	0
12	Kakching	7	4	57.1	3	3	2	0	2
13	Hiyanglam	5	3	60	0	3	0	0	0
14	Wabagai	5	2	40	1	1	0	0	0
	Total	87	46	52.9	25	27	7	1	7

Table 2. Prevalence of endoparasites of chicken based on gut examination

Name of the helminth parasite	No. hosts infected	Prevalence (%)
<i>Raillintina</i> sp	25	41.67
<i>Ascaridia</i> sp.	27	45
<i>Heterakis</i> sp.	7	11.66
<i>Strongylidae</i> sp.	1	1.67
Total	60	100

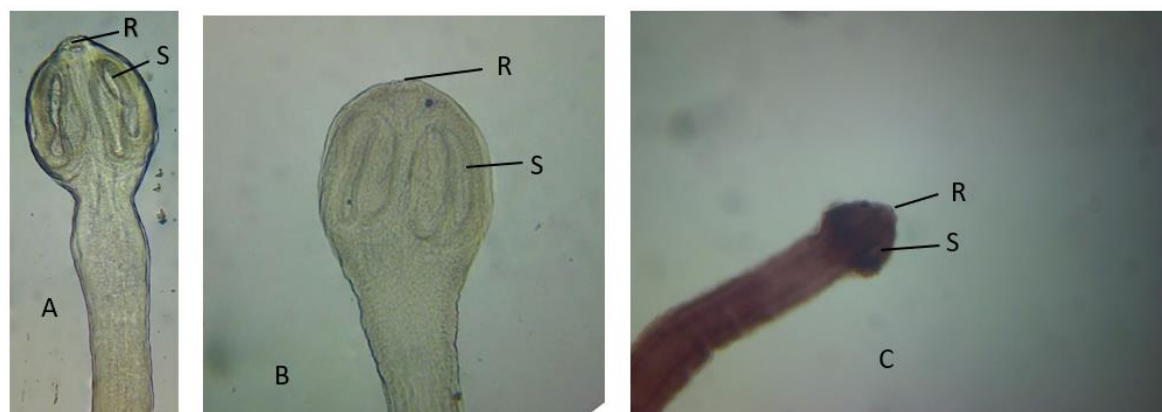


Fig. 3. Morphological identification of Raillietina Sp.

(A) *R. echinobothrida*, (B) *R. tetragona*, (C) *Raillietina* Sp., Scolex bearing the rostellum with hooks (R) surrounded by four suckers (S)



Fig. 4. Morphological identification of *Heterakis gallinarum*.,

Male (A) and female (B), (A1, B1) anterior end and (A2, B2) posterior end and (C1, C2) female and male of *Ascaridia* Sp. respectively

4. CONCLUSION

This study indicated that Cestodes and Nematode are highly significant helminth problems of local free range chicken in the study area and therefore measures should be taken to control these helminth parasites by educating the farmers on the impact of the disease, conditions that increase the prevalence of the disease in a locality with the aim of educating them on prevention and control methods by regular deworming of the chickens with improved management system. Site preferences by the parasites in the gastrointestinal tract of the birds were small intestine, large intestine and caeca.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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