Occurrence of Some Gastrointestinal Cestode Parasites of *Gallus gallus domesticus* Linnaeus, 1758, Hinthada Markets

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Abstract

The study on the occurrence of some gastrointestinal cestodes parasites of *Gallus gallus domesticus* was conducted from Hinthada Township. It was carried out from January 2020 to August 2020. In the present study, a total of 188 (78.33%) gastrointestinal tracts out of 240 specimens was observed as the parasitic infection. The collected gastrointestinal cestodes were examined under microscope. A total of 13 species belonging to six genera, four families and three orders were recorded. They were namely, *Clestobothrium* sp, *Proteocephalus* sp, *Ophiotaenia* sp, *Hymenolepis nana, Hymenolepis* sp, *Raillietina echinobothrida, Raillietina tetragona, Raillietina apivori, Raillietina* sp.1, *Raillietina* sp.2, *Raillietina* sp.3, *Raillietina* sp.4 and *Choanotaenia infundibulum.* At the present study, the highest percentage of parasite species (76.92%) was recorded from order Cyclophyllidae and the lowest (7.69%) recorded from order Bothriocephalidea. The highest prevalence number of infections was recorded by cestodes (Total number = 1865). At the present study, species of cestodes, *Raillietina* species were most prevalence in the domestic fowls. The monthly prevalence of cestodes infection was the highest in August and the lowest in May. The highest number of infected chickens was observed in April. The morphological examinations of recorded cestodes were also presented.

Keywords: Species-composition, morphology and prevalence of cestodes

INTRODUCTION

A domestic fowl or chicken (*Gallus gallus domesticus*), belonging to the family Phasinidae, is a subspecies of Red Jungle Fowl. It is one of the most common and widespread domestic animals, with a total population of more than 19 billion in 2011. It is one of the common and domesticated birds than any other species in the world. Human keep chickens primarily as a source of food, consuming both their meat and their eggs. (UNFAO, 2011).

Poultry are kept in backyards or commercial production systems in most areas of the world. Compared to a number of other livestock species, fewer social and religious taboos are related to the production, marketing and consumption of poultry products. For these reasons, poultry products have become one of the most important protein sources for man throughout the world (Abdul-Hamed, 1984). The world poultry population has been estimated to be about 16.2 billion, with 71.6% in developing countries, producing 67,718, 544 metric tons of chicken meat and 57,861,747 metric tons of hen eggs (Gueye, 2005).

The rural population of Myanmar comprises 75% of the country's total production (UNDP, 2006) and chickens are kept by the large majority of rural families. A total of 84% of Myanmar's total chicken population were kept under scavenging conditions in villages (59.6 million), while only 12% were commercial layers (8.7 million) and 4% (2.9 million) commercial broilers (Henning, 2007).

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In developing countries, poultry production offers an opportunity to feed the rapidly growing human community and to provide an earning source for poor farmers. Moreover, poultry in many parts of the present day is considered not only inexpensive animal protein but also highly quality human food (CSA, 2009).

Nematodes, cestodes and trematodes are major parasites of poultry animal. These parasites can be found in the intestine or feces, droppings especially when expelled as fresh specimen. Several species of cestodes may live in intestinal tract of chickens. More than 1,4000 tapeworms have been described in domesticated poultry and wild bird which are common in poultry free range or backyard flocks. 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 (Zubeda *et al.*, 2012).

Chicken infected with parasites show retarded growth, decreased egg production, reduced weight gained, significant haemoglobin depression (Nair and Nadakal, 1981), villous atrophy, catarrhal enteritis, granuloma formation in duodenum, desquamation of villi and submucosal glands congestion, inflammatory reaction and vacuolation of epithelial cells (Kurkure and Ganorkar, 1998).

Parasitism is an association in which the parasite is metabolically dependent to a greater or lesser extent to the host. Gastrointestinal parasites are, however, the most prevalent and most devastating parasites affecting chicken productivity (Swaton *et al.*, 2003).

The eggs and immature stages of many parasitic worms can live outside of the chicken host for a long time, possibly several years, whereas some parasitic worms spend part of their life cycle in other creatures such as earthworms, insects, slugs or snails. Chicken pick up worms by eating dirt or litter contaminated with worm eggs or by eating small creatures carrying intermediate stages of worms (Janquera, 2017).

The common internal parasitic infections occur in poultry induced gastrointestinal helminth (cestodes and nematodes) that cause considerable damage and great economic losses to the poultry industry due to malnutrition, decreased with conversion ratio, weight loss, lowered egg production and death in young birds (Puttaashmamma, 2008).

Therefore, the parasitic diseases are the most important challenge militating against poultry production. The present study was conducted to know the baseline information on the prevalence of intestinal cestodes of domestic fowl in Hinthada environs by the following objects,

- to examine the morphological characters of recorded parasite species
- to record the intestinal parasite species in domestic fowl from the study area
- to determine the prevalence infestation rate of parasite

MATERIALS AND METHODS

Study area

This study was conducted at Hinthada environ 17˚36'0″ N and 95˚125'30″ E. The Sakhanthar Station and Yadanarbon markets have been chosen for sample collection.

Study period

The study period lasted from January, 2020 to August, 2020.

Collection of specimens

Specimen were collected twice a month. A total of 240 alimentary tracts were collected from those two markets and brought to the laboratory, Department of Zoology, Hinthada University to examine the parasites.

Examination of parasites

The intestinal and caecum regions of each host were cut away from the tract and placed separately in petridishes. Dissections were made the entire length of the intestine with scissors. The content of the gut was carefully rinsed and washed slowly in normal saline according to Kennedy (1979). The parasites in the petri dishes with normal saline were placed against a black background to examine the parasites aided by a light source. Once the parasites were spotted they were picked either by a pair of fine forceps and transferred into another petridish with normal saline.

Scolex of cestodes were deeply embedded in the intestinal wall. They were removed by gently stretching the strobili with a pair of fine forceps. The surrounding tissues were teased away carefully by the use of fine needles or pointers. These parasites when dislodge were washed in normal saline and in tap water.

Study of the parasites

The parasites were studied under the microscope and photographs were taken with the aid of binocular compound microscope for diagnostic purpose. Glycerine was used as a clearing agent. The preparation was then examined under the microscope using 100 x and 40 x magnification.

Identification

The identification and classification of the parasite were followed after Lapage (1968), Meggitt (1927), Soulsby (1965) and (1982), Schmidt and Roberts (1989).

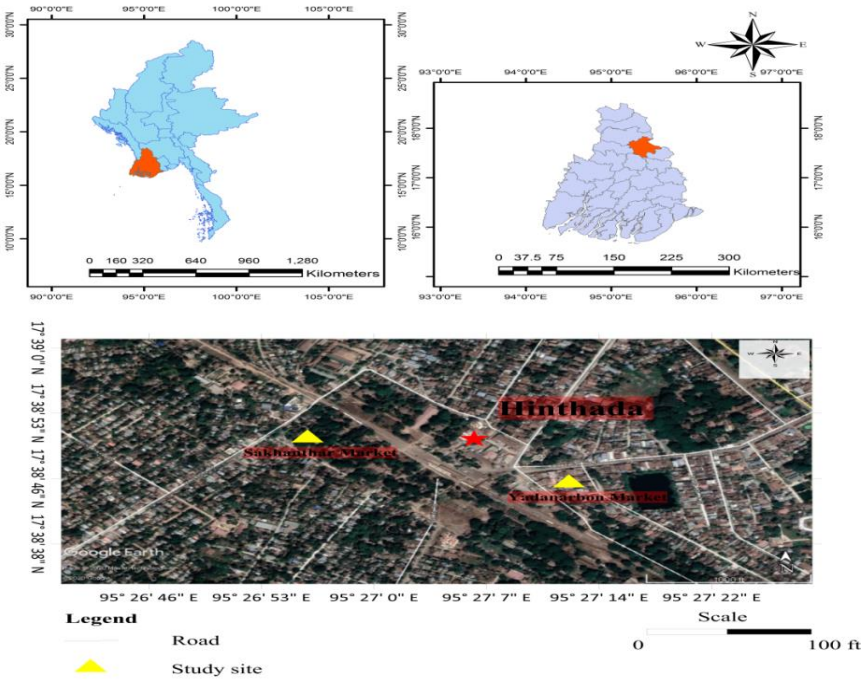


Fig (1) Location map of study area

Source; (Google search)

Sakhanthar station market

Yadanarbon market

Binocular compound microscope

Apparatus

Plate (1) Study site and equipment used in the laboratory

Plate (2) *Gallus gallus domesticus* and digestic tract

RESULTS

Species composition of gastrointestinal parasites

A total of 13 species belonging to six genera, four families and three orders were recorded in the gastrointestinal tract of domestic fowls. Out of these species, ten species were under order Cyclophyllidea belonging to family Davaineidae, two species in family Hymennolepididae, one species in order Bothriocephalidea belonging to family Bothriocephalidae and two species in order Onchoproteocephalides belonging to family Proteocephalidae. They were *Clestobothrium* sp, *Proteocephalus* sp, *Ophiotaenia* sp, *Hymenolepis nana*, *Hymenolepis* sp, *Raillietina echinobothrida*, *Raillietina tetragona*, *Raillietina* sp.1, *Raillietina* sp.2, *Raillietina* sp.3, *Raillietina* sp.4, *Raillietina apivori* and *choanotaenia infundibulum* of cestodes.

Prevalence of parasitic infection

A total of 188 (78.33%) gastrointestinal tracts out of 240 specimens were observed as the parasitic infection. The total number of cestodes (n = 1865) were recorded during the study period. In the study period, the highest number of cestodes was recorded in August (Table-2, Figure-3).

Systematic position of the studied parasites

Phylum - Platyhelminthes

Class - Cestoda

Order - Bothriocephalidea

Family - Bothriocephalidae

	Genus	- *Clestobothrium* Liihe, 1899
(i)	Species	- *Clestopothrium* sp
	Order	- Onchoproteocephalidea
	Family	- Proteocephalidae
	Genus	- *Proteocephalus* Weinland, 1858
(ii)	Species	- *Proteocephalus* sp
	Genus	- *Ophiotaenia* La Rue, 1911
(iii)	Species	- *Ophiotaenia* sp
	Order	- Cyclophyllidea
	Family	- Hymenolepididae
	Genus	- *Hymenolepis* Weinland, 1858
(iv)	Species	- *Hymenolepis nana* (Bilharz, 1851)
(v)	Species	- *Hymenolepis* sp
	Family	- Davaineidae
	Genus	- *Raillietina* Fuhrmann, 1920
(vi)	Species	- *Raillietina echinobothrida* Megnin, 1880
(vii)	Species	- *Raillietina tetragona* Molin, 1858
(viii)	Species	- *Raillietina apivori* Makrenko, 1963
(ix)	Species	- *Raillietina* sp.1
(x)	Species	- *Raillietina* sp.2
(xii)	Species	- *Raillietina* sp.3
(xii)	Species	- *Raillietina* sp.4
	Genus	- *Choanotaenia* (Bloch, 1779)
(xiii)	Species	- *Choanotaenia infundibulum* (Bloch, 1779)

Descriptive characters of recorded parasites

(i) *Clestobothrium* sp

The scolex is globular to oval, projecting posteriorly over first proglottids. Apical disc is weakly developed on the scolex. A strobila composed of segments and proglottids is usually longer than wide. There are two lateral longitudinal continuous bands along the strobila (Plate 3(A)).

(ii) *Proteocephalus* sp

The club-shaped scolex is conspicuously wider than immature and mature proglottids. The scolex consists of four suckers. The suckers are circle shaped with thick margin and situated at the apex of the scolex. Numerous anastomoses are present in scolex and neck region. Body is longer than wide (Plate 3(B)).

(iii) *Ophiotaenia* sp

Somewhat tetragonal head with no rostellum and hooks or spines. Suckers unlocated, circular oval, slightly embedded with margin entire. Necks are usually long. Scolex are external segmentation. Gravid proglottid is longer than wide (Plate 3(C)).

(iv) *Hymenolepis nana* (Bilharz, 1851)

Scolex is small and like globular cup. It has four suckers and has a short rostellum armed. Scolex situated at the anterior end. Rostellum is retractable and always remains invaginated at the apex of the organ. The neck is long and slender, the segments are wider than long (Plate 3(D)).

(v) *Hymenolepis* sp

It has a long cylindrical body with 4 suckers and an apical organ at its scolex with no rostellar hooks. The scolex in this species is unarmed, and the width of each proglottids is greater than its length (Plate 3(E)).

(vi) *Raillietina echinobothrida* Megnin, 1880

The scolex was unambiguously round, distend and there is bulbous anterior end of the body. Their suckers were protruding oval structures, while the apical rostellum was distinctly an invaginated, depressed and hollow structure, and the thick short neck. It is composed of ribbon-like body segments, gradually enlarging from the anterior end towards the posterior. The scolex bears four suckers (Plate 3 (F)).

(vii) *Raillietina tetragona* Molin, 1858

The worms are rather thick. The scolex is large and, with a distinct neck. The rostellum is armed with small hammer-shaped hooks arranged in two rows. The scolex bearing the small round rostellum surrounded by four ovoid suckers. All segments are broader than long (Plate 3(G)).

(viii) *Raillientia apivori* Makrenko, 1963

The scolex is large and consists of four suckers. Suckers are large of prominent margin and armed with the small spinules located at spiral ranks. It has long thick neck sucker are double. The scolex consists of four suckers and rostellum is located at the tip (Plate 3(H)).

(ix) *Raillietina* sp.1

Suckers are circle shaped with thick margin and situated at the tip. The rostellum is a little invaginate. The neck is narrow. The segments are numerous and broad. (Plate 3 (I)).

(x) *Paillietina* sp.2

The scolex consists of four suckers and these are somewhat oval in shape. The suckers on scolex became invaginated due to shrinkage. Body is highly elongate and dorsoventrally flattened. The neck is distinct. All segments are broader than long. The rostellum is hollow and situated at the tip of scolex (Plate 3 (J)).

(xi) *Raillientina* sp.3

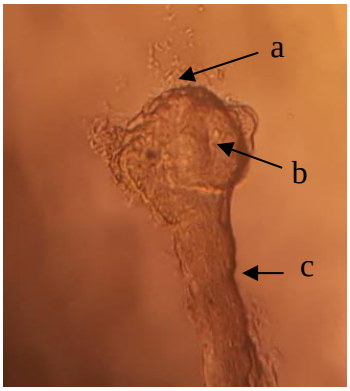
The scolex is large and with a thick distinct neck. It has small round rostellum and ovoid suckers. The scolex consists of four suckers (Plate 3 (K)).

(xii) *Raillietina* sp.4

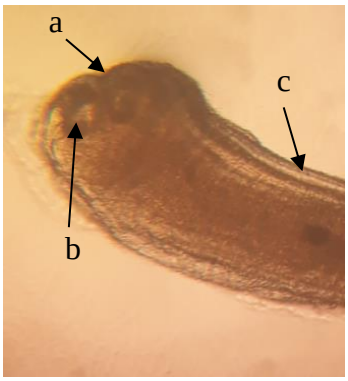
Suckers have prominent margin with several minute hooks and it is oval in shape. It has a long thick neck and suckers are double. The scolex consists of four suckers (Plate 3(L)).

(xiii) *Choanotaenia infundibulum* (Bloch, 1779)

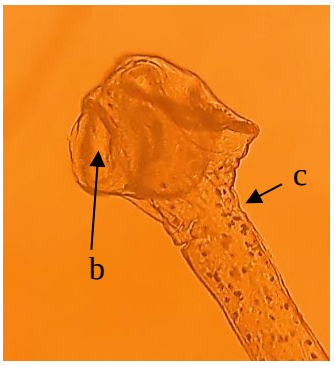
The scolex is triangular in shape. The suckers are oval in shape. The neck is narrow, and short and followed by few very broad segments. The mature segments are usually more or less bell shape, broader posteriorly than anterior (Plate 3 (M)).



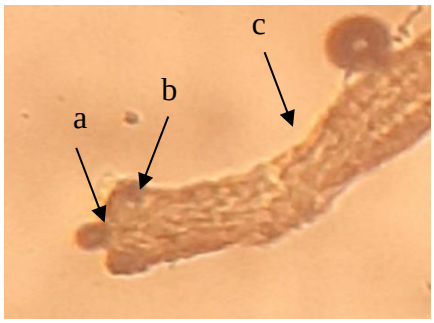
A. Scolex of *Clestobothrium* sp (x40)



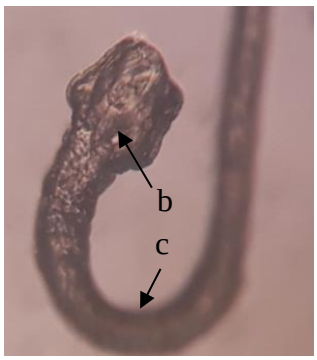
B. Scolex of *Proteocephalus* sp (x100)



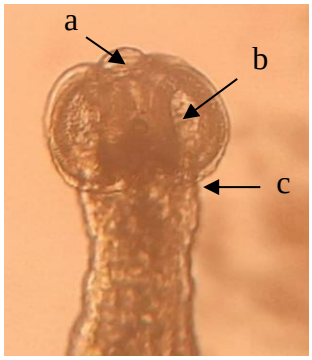
C. Scolex of *Ophiotaenia* sp (x100)



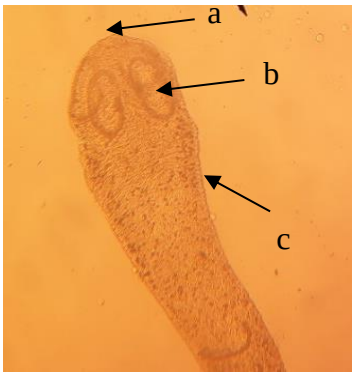
D. Scolex of *Hymenolepis nana* (x40)



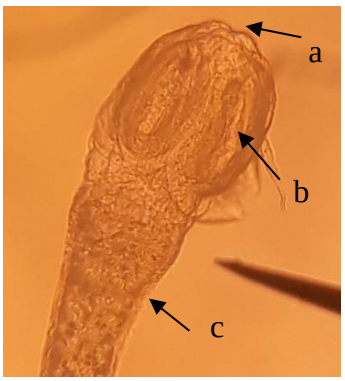
E. Scolex of *Hymenolepis* sp (x40)



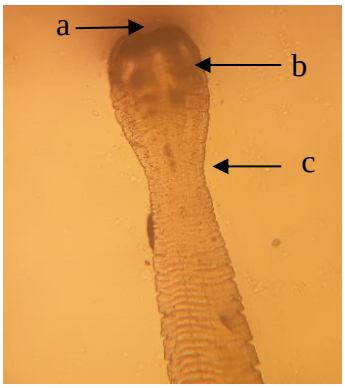
F. Scolex of *Raillietina echinobothrida* (x100)



G. Scolex of *Raillietina tetragona* (x40)

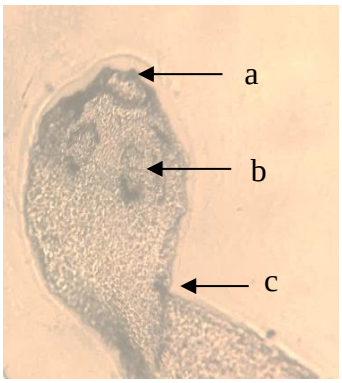


H. Scolex of *Raillietina apivori* (x100)
a. Rostellum
b. Sucker
c. Neck

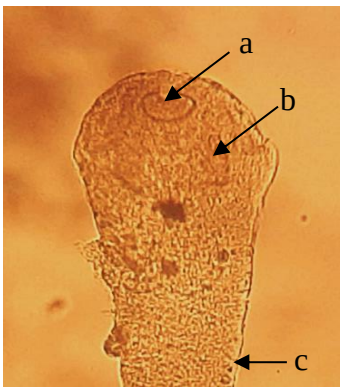


I. Scolex of *Raillietina* sp.1 (x40)

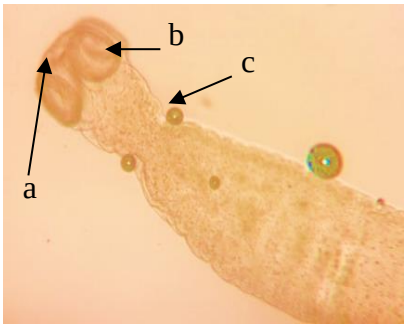
Plate (3) Morphology of recorded cestodes



J. Scolex of
Raillietina sp.2 (x100)

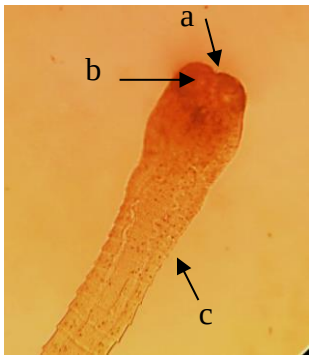


K. Scolex of
Raillietina sp.3 (x100)



L. Scolex of
Raillietina sp.4 (x100)

a. Rostellum
b. Sucker
c. Neck



M. Scolex of
Choanotaenia infundibulum (x40)

Plate (3) Morphology of recorded cestodes (Continued)

Table (1) Percentage of recorded cestode species composition of the orders

Sr No.	Order	Family	Genus	No of species	Percentage (%)
1.	Cyclophyllidea	2	3	10	76.92
2.	Bothriocephalidea	1	1	1	7.69
3.	Onchoproteocephalidea	1	2	2	15.38
	Total	4	6	13	100.00

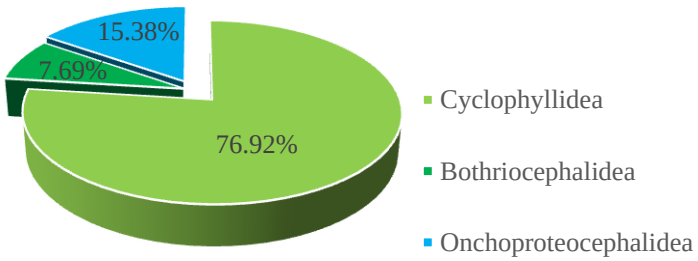


Fig (2) Percentage of recorded cestode species in different orders

Table (2) Percentage of monthly prevalence cestodes

Month	No of infected chicken	No of cestodes	Percentage (%) of cestode
March	33	279	14.96
April	35	295	15.82
May	27	250	13.40
June	29	285	15.28
July	31	357	19.14
August	33	399	21.39
Total	188	1865	100%

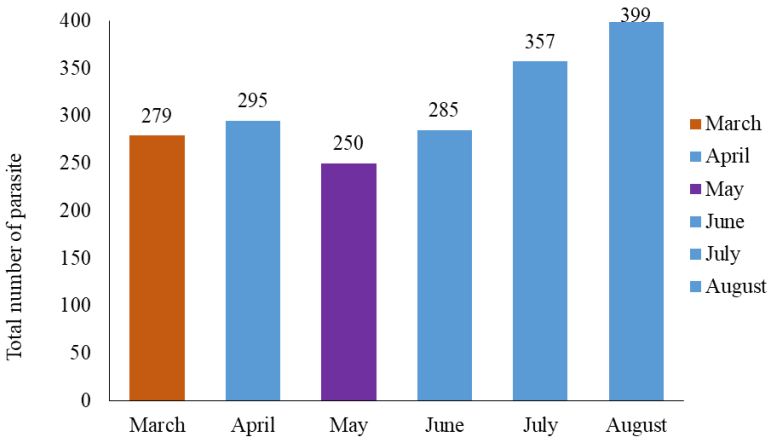


Fig (3) Monthly variation of infection

Table (3) Monthly prevalence of parasites infection

Month	No of chicken	No of infected chicken	Infected percentage %
March	40	33	17.55
April	40	35	18.62
May	40	27	14.36
June	40	29	15.43
July	40	31	16.49
August	40	33	17.55
Total	240	188	100%

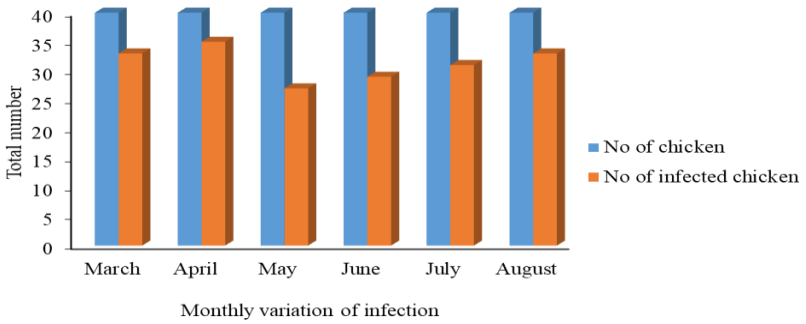


Fig (4) Monthly variation of infected chicken

DISCUSSION

The food security should be important in healthy people. Moreover, chicken is common in all food items such as breakfast, lunch and even refresh. Chicken is main preparation for all categories of food production food items for all.

At the present study, a total number of 240 intestines of domestic fowls were examined and the gastrointestinal parasite (cestodes) was found in 188 (78.33%) number of intestines. The result revealed that a total of 13 species of cestodes belonging to six genera, four families and three orders were recorded. The percentage of species occurrence was found to be the highest in order Cyclophyllidea (76.92%) while those of order Bothriocephalidea (7.69%) was the lowest. According to Saw Ohnmar (1998) seven species of cestodes and four species of nematodes were recorded in bird from Yangon area. In the present study, three out of 7 species, *Raillietina tetragona, Raillietina echinobothria* and *Railletina* species were similar to her finding.

Similar observation was made by Nadakal *et al.,* 1972 who stated that the highest prevalent rate of cestodes was followed by nematodes and trematodes in birds.

Among the cestodes parasite species of domestic fowls revealed from the present study, *Raillietina* species was dominant helminth parasite species. Similar observation was made by (Butboonchoo, 2016). Among the Davaineid genera, the most common is *Raillietina* sp Fuhrmann, 1920 with about 295 species reported from avian and mammalian hosts, including human, their high pathogenic in domestic chickens (*Gallus gallus domesticus*).

Present study revealed that mixed infection with gastrointestinal parasites of different species was more common than infection with single species in domestic fowl.

Among the 240 specimens, 188 specimens (78.33%) were infected with the gastrointestinal parasites. The monthly prevalence of cestode infection was the highest in August. Fotedar and Khateeb (1986) stated that the highest prevalence of helminth parasites in September and lowest in December and January. Indeed, Butboonchoo and Wongsawad (2017) revealved that the total prevalence of infection was 99.2% in rainy season. This finding is similar to previous study. It was assumed that the environment conditions may be favourable to the simultaneous development and available food consumption influenced upon the infestation rate of parasite in August.

Naphadae and Chaudhair (2013) observed high prevalence of gastrointestinal parasites during the summer season.The result of the present study were not agreed with their resutls. Mungube *et al*., 2008, Permin and Hansen, (2003) stated that the suitable temperature (range 10-40˚C) and sufficient moisture can affect the parasite survival and egg development to the infective stages.

During this study it was noted that cestodes were mostly found in the small intestine. Saw Ohnmar (1998) recorded also trematodes were collected from caecum and small intestine, cestodes were collected from small intestine and nematodes were collected from intestine and caecum.

In the present study, cestodes caused the formation of tubercles on the intestinal wall of the infected fowls. Ahenafi and Eshetu (2004) indicated that the nodule formation induced by *Railietina echinobothrida* may lead to confusion with lesions of avian tuberculosis.

Raillietina tetragona is one of the largest species of the domestic fowl tape worms. It has oval shape of the suckers and hooks. Lopez-Neyra (1931) reported that small nodules were found in the intestine and often stated to be a highly pathogenic species. *Raillietina*

echinobothrida and *Raillietina tetragona* were recorded in this study more or less prevalence. These two parasites were observed throughout the study period in nearly all the fowls.

Hymenolepis nana, *Hymenolepis* sp and *Clestobothrium* were readily recognizable by its very slender and thread like form. These tapeworms sometimes occur in large number in chicken. The suckers of *Raillietina apivori* is large and armed with the small spinules. *Hymenolepis* sp and *Ophiotaenia* sp. have no rostellum and hooks.

Naphadae and Chaudhair (2013) stated that cesodes parasites cause heavy economic losses in the form of retarded growth. Nair and Nadakal, (1981) also reported that the chickens infected with cestodes parasites and showed retarded growth, decrease egg production, reduced weight gain, significant hemoglobin depression. Kurkure *et al.*, 1998 stated that serious infection causes callous atrophy, catarrhal enteritis, granuloma formation in duodenum, desquamation of villi and submucosal glands congestions, inflammatory reaction and vacuolation of epithelial cells.

Therefore, the infestation with gastrointestinal parasite should be considered as the disease control in poultry production. This study will support the food safety of markets in Myanmar.

CONCLUSION

The study reveals that there was a high prevalence of intestinal cestodes of *Gallus gallus domesticus* in the study area. The *Raillietina* species was the dominant helminth parasite species identified by examination. The higher prevalence of cestodes in the present study should be due to frequently exposure of the chicken to intermediate host of cestodes. The gastrointestinal parasites are one of the common parasites causing serious troubles in chicken production and can cause death which affects the economy. The management system and hygiene conditions should be improved for better growth. The present study was carried out to determine the baseline information on the diversity and prevalence of intestinal cestodes of local chickens.

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