Research Article

Occurrence of Gastrointestinal Parasites in Free Ranging Village Chickens from Four Townships of Myanmar

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Abstract | This study was conducted to investigate the occurrence of gastrointestinal parasites in village chickens from four Townships (Mawlamyine, Nyaung U, Zay Yar Thi Ri and Katha) of Myanmar from April to June 2019. A total of 200 faecal samples were randomly collected from village chickens. Centrifugal sugar floatation and sedimentation methods were carried out to detect the gastrointestinal parasites. The overall occurrence of gastrointestinal parasites in village chickens was 60.5% (121/200). Six species of gastrointestinal parasites were observed as *Capillaria* spp. (30.0%, 60/200), *Ascaridia galli* (24%, 48/200), *Eimeria* spp. (20.5%, 41/200), *Raillietina* spp. (17%, 34/200), *Strongyloides* spp. (2.5%, 5/200) and *Subulura brumpti* (2.0%, 4/200). Mixed infection rate was 54.5% while single infection rate was observed as 45.5%. The highest occurrence of gastrointestinal parasites (66.0%) was observed in Nyaung U Township followed by Zay Yar Thi Ri (60.3%), Katha (60.0%) and Mawlamyine (53.5%). As infection rate was relatively high, gastrointestinal parasites prevention and biosecurity measure should be improved.

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Introduction

In Myanmar, about 80% of the total chicken population, approximately 70 million birds, are kept under scavenging conditions in villages (Animal census, 2018, personal communication with Livestock Breeding and Veterinary Department). This production is mostly based on the slow-growing native breeds and raised in backyards. Village chickens are raised with the purpose of not only extra household incomes, but also for protein source especially from chicken meat. In addition, village chicken's eggs are mainly used for fertilization (Henning et al., 2007). Recently, farmers are trying to upgrade from the backyard farmig system to confined all in - all out systems because of the double price of the village chicken meat than the commercial poultry meat in the market. However, chicken raising with traditional method could result in low input, low output and periodic destruction of a large portion of the flock because of disease causing agents such as viruses, bacteria and parasites (Sayyed et al., 2000). Although parasitic infections include one of the major factors inflicting heavy economic losses to poultry production in the form of retarded growth, reduced weight gain, decrease in egg production,

diarrhoea, intestinal obstruction and poor feathers, these are often neglected because the infections become subclinical most of the time. Moreover, parasitic stress could affect the blood chemistry and caused anorexia (Dube et al., 2010).

In Myanmar, there is only one report of gastrointestinal parasite infestations in village chickens in Mandalay and Nay Pyi Taw areas with the occurrence of 68.6% containing *Eimeria* spp. (55.1%), *Ascaridia galli* (27.5%) and *Capillaria* spp. (1.8%) (Mon, 2017). The investigation of gastrointestinal parasite occurrence in free ranging village chickens is essential for understanding parasite species distribution and for performing effective control measures in the study areas. However, there is little emphasis on parasitic infestations in free ranging village chickens of Myanmar. Therefore, this study was carried out to investigate the occurrence of gastrointestinal parasites in village chickens from four different areas (Mawlamyine, Nyaung U, Zay Yar Thi Ri and Katha Townships) of Myanmar.

Materials and Methods

Study area

This study was carried out in Mawlamyine, Nyaung U, Zay Yar Thi Ri and Katha Townships (Figure 1). Mawlamyine Township is located in the Mon State, the lower part of Myanmar and is situated between 16°27'15.54"N latitude and 97°38'38.26"E longitude at 16.45m above sea level. Nyaung U Township is located in the Mandalay Region and also included in the Central Dry Zone (CDZ) of Myanmar. It is situated between 21°10'38.11"N latitude and 94°55'28.95"E longitude and elevated about 96.39m above sea level. Katha Township is located in the Sagaing Region, beside the Ayeyarwady River and elevated 121.25m above sea level. It is situated between 24°10'55.63" N latitude and 96°19'50.1" E longitude. Zay Yar Thi Ri Township is included in Nay Pyi Taw Union Territory and situated between 19°52'52.99"N latitude and 96°15'50.94"E longitude and 162m elevation above sea level (https://www.distancesto.com/coordinates.php). These locations have different weather and environmental conditions. The study was conducted in three to four villages from each Township.

Study design and study population

A cross-sectional study was conducted on village chickens from four Townships (Mawlamyine, Nyaung U, Zay Yar Thi Ri and Katha) of Myanmar from April to June 2019. A total of 200 faecal samples from village chickens were randomly collected from the four Townships (Table 1).

Figure 1: *Map showing location of study areas within Myanmar.*

Table 1: *Total number of samples collected in the four Townships.*

	No. of samples collected in four Townships				Total no.
	MLM	NU	KT	ZYTR	
Collected sample	42	50	50	58	200

MLM: Mawlamyine; NU: Nyaung U; KT: Katha; ZYTR: Zay Yar Thi Ri.

Faecal sample collection

Freshly deposited faeces or on-ground faeces of individual chicken were immediately collected and put into individual zip lock bags, labelled, put into an

ice box and carried to the Laboratory of Department of Pharmacology and Parasitology, University of Veterinary Science, Yezin, Nay Pyi Taw, Myanmar. Samples were kept in a refrigerator at 4°C before the faecal examination was performed.

Faecal examination

To examine the helminth infestations, centrifugal sugar floatation and sedimentation methods were conducted according to Foreyt (2001). For floatation, 1g of faeces and 10-12ml of water were mixed, sieved and put into a 15ml centrifuge tube and centrifuged at 1500rpm for 10mins. Then, supernatant fluid was discarded, saturated Sheather's sugar solution was added and centrifuged again at 1500rpm for 10mins. Next, the tube was filled with sugar solution and a cover slip was placed on the tube and it was left to stand for 30mins to adhere the floated parasite eggs and oocysts. For sedimentation, faecal suspension of 1g of faeces and 10-12ml water was filtered with a sieve into a beaker and it was left to stand for 30mins to enable sedimentation of the heavy parasite eggs. Parasite eggs and oocysts were examined under compound microscope with 100× and 400× magnification. Parasite eggs were identified based on morphological identification guidelines provided by Soulsby (1982).

Results and Discusion

Among the 200 faecal samples examined, 121 samples (60.5%) were positive for one or more gastrointestinal helminth species eggs or oocyts. Gastrointestinal parasite distribution and occurrence are summarized in Table 2. In this study, four nematode species, such as *Capillaria* spp. (49.6%), *Ascaridia galli* (39.7%), *Strongyloides* spp. (4.1%) and *Subulura brumpti* (2.0%) were observed (Figure 2). Only one cestode spp.; *Raillietina* spp. (33.9%) and protozoa; *Eimeria* spp. (28.1%) were observed (Figure 2). Mixed infestations were found at a rate of 54.5% (66/121) while single infestations were 45.5% (55/121). Of the mixed infestations, 63.6% (42/66) were for two parasite species, 18.2% (12/66) had three parasite species, and four and five parasite species infestations were both observed in 1.5% (1/66) of the samples. The highest occurrence (75.2%) was observed with nematode followed by *Raillietina* spp. (33.9%) and *Eimeria* spp. (28.1%). The highest gastrointestinal parasite infection rate was 66.0% in Nyaung U Township and followed by Zay Yar Thi Ri (60.3%), Katha (60.0%) and Mawlamyine (53.5%) (Figure 3).

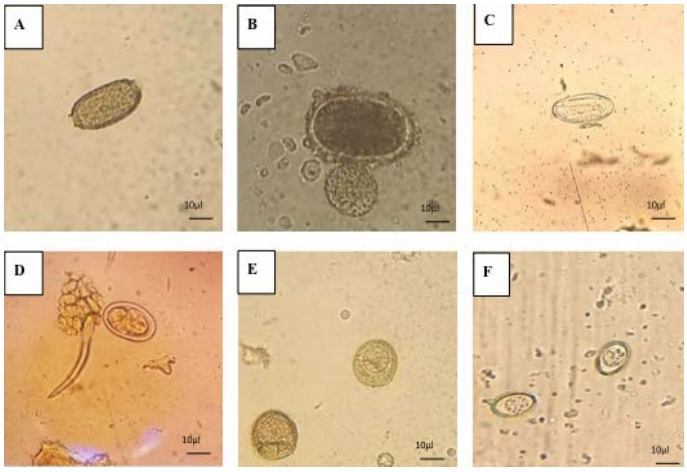

Figure 2: *A) Capillaria spp.; B) Ascaridia galli; C) Strongyloides spp.; D) Subulara brumpti; E) Raillietina spp.; F) Eimeria spp. (400×).*

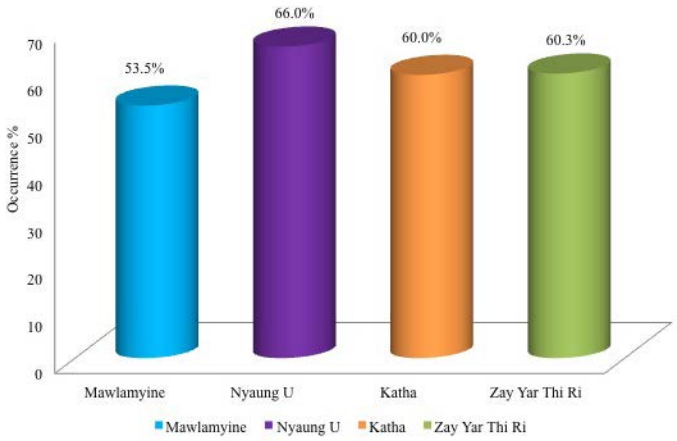

Figure 3: *Occurrence of gastrointestinal parasites in the four Townships.*

Gastrointestinal parasites were found in 121 of the 200 samples collected from the four Townships, representing an occurrence of 60.5%. Mon (2017) reported that the occurrence of intestinal parasite infestation in village chickens was 68.6% in Mandalay and Nay Pyi Taw areas, Myanmar. Comparatively, higher occurrence was also reported in Thailand (92.2%), Philippines (92.2%), Kenya (90%), Ethiopia (90.97% and 72.4%) Bangladesh (84.6%), and Ghana (65.5%) (Butboonchoo and Wongsawad, 2017; Ybanez et al., 2018; Maina et al., 2017; Berhe et al., 2019; Solomon and Yobsan, 2017; Ferdushy et al., 2016; Asumang et al., 2019). However, the lower occurrence than this study was reported in Nigeria (20.5%) and Trinidad (34.9%) (Afolabi et al., 2016; Baboolal et al.,2012). The occurrence differences might be related to geographical variation, management practices on farms, time of sampling, environmental factors for favourable conditions of parasites and

Table 2: *Occurrence of gastrointestinal helminths in four Townships.*

Parasites	Positive % and no. in four Townships				Overall Positive % and no.
	MLM N=42	NUN=50	KTN=50	ZYTRN=58	
Ascaridia galli	21.4% (9)	32% (16)	26% (13)	17.2% (10)	39.7% (48)
Capillaria spp.	23.8% (10)	26% (13)	26% (13)	41.4% (24)	49.6%(60)
Strongyloides spp.	4.7% (2)	0	0	5.2% (3)	4.1% (5)
Subulura brumpti	7.1% (3)	0	0	1.7% (1)	2.0% (4)
Raillietina spp.	7.1% (3)	36% (18)	14% (7)	10.3% (6)	28.1% (34)
Eimeria spp.	4.7% (2)	22% (11)	12% (6)	38% (22)	33.9% (41)

MLM: Mawlamyine; NU: Nyaung U; KT: Katha; ZYTR: Zay Yar Thi Ri; N: Number.

control practices employed in individual localities. In this study, all farms did not have veterinary care and were practicing a free ranging system and this might lead to higher occurrence of gastrointestinal parasites.

The mixed infestation with two or more parasite species in village chickens was 54.5% while single infestation was 45.5%. A higher mixed infestation rate was reported in Thailand (92.4%) and Ethiopia (87.7%) (Butboonchoo and Wongsawad, 2017; Berhe et al., 2019). However, the lower mixed infestation rates were recorded in the Mexican Tropics (42%) (Cervantes-Rivera et al., 2016), India (12.8%) (Sreedevi et al., 2016) and Egypt (7.05%) (El-Dakhly et al., 2018). The variation of mixed infestation rate might be due to regional variability.

Among the 121 positive cases, four nematode species (*Capillaria* spp., *Ascaridia galli*, *Strongyloides* spp. and *Subulura brumpti*) (75.2%), were observed as well as *Eimeria* spp. (33.9%) and *Raillietina* spp. (28.1%). Similar findings of more nematodes over cestodes were reported in India (Naphade and Chaudhari, 2013; Sreedevi et al., 2016), Ethiopia (Mekibib et al., 2014; Solomon and Yobsan, 2017) and Kenya (Maina et al., 2017). In contrast, higher infestation of cestodes than nematodes in chickens was discovered in Malaysia, Thailand, Egypt and Ethiopia (Suhaila et al., 2015; Butboonchoo and Wongsawad, 2017; El-Dakhly et al., 2018; Berhe et al., 2019). The reason might be the fact that most *nematode* spp. do not require intermediate hosts while cestodes require intermediate host presenting less chance for infestation with cestodes than nematodes in the environment of this study. Intermediate hosts (dung beetles, ants) are also important factors in cestode infections of village chickens. In addition, adult nematodes lay many eggs daily which can retain their viability for as long as 12 months. Thus, domestic fowls are constantly picking up viable eggs from the droppings that contaminate the environment as they feed (Permin and Hansen, 1998). Therefore, the habit of high fecundity in nematodes and poor sanitation might be an important source of infection.

In the present study, Nyaung U Township had the highest gastrointestinal parasite infection rate (66.0%), followed by Zay Yar Thi Ri (60.3%), Katha (60.0%) and Mawlamyine (53.5%). In Nyaung U, raising village chickens was more popular than in the other localities and a free ranging system was practiced. Thus, the population was more crowded in this study area, presenting the opportunity for a greater rate of infection to occur.

Capillaria spp. (49.6%) had the highest occurrence in this study, with a similar infection rate found in the Mexican Tropics (46.5%) (Cervantes-Rivera et al., 2016). This occurrence was higher than that in Mandalay and Nay Pyi Taw areas (Mon, 2017). The life cycle of some *Capillaria* spp. is indirect and earthworms act as intermediate host. In this study, village chickens were raised free range, so infection can occur by ingesting of earthworms or infective stages in the environment. Moreover, Capillariasis can be highly pathogenic for birds in deep-litter systems or in free-range systems where big numbers of infective eggs may build up in the litter or in the soil (Permin and Hansen, 1998).

The species with the second highest occurrence in this study was *Ascaridia galli*, with an occurrence of 39%. Similar occurrence was observed in Philippines (Ybanez et al., 2018). Lower occurrences than the present study were reported in Iran, Cameroon and Nigeria (Radfar et al., 2012; Nghonjuyi et al., 2014; Afolabi et al., 2016). However, higher infestation rates were reported in Ethiopia and the Mexican

Tropics (Mekibib et al., 2014; Cervantes-Rivera et al., 2016; Berhe et al., 2019). These differences might be attributable to the differences in temperature and humidity. The shells of *Ascaridia galli* eggs are thick which gives them resistance to desiccation which might give them a higher chance of meeting with a new host for transmission while they are still surviving in the environment.

The overall occurrence of *Eimeria* spp. infestation in the four Townships was 33.9%. This occurrence was in-line with the occurrence in Cameroon (Nghonjuyi et al., 2014). However, this occurrence was lower than that in Mandalay and Nay Pyi Taw areas (Mon, 2017). These differences might be due to differences in management practices and usage of coccidiostats as preventive measures in the study areas. In addition, the life cycle of *Eimeria* spp. is short when compared to helminths and oocysts walls are resistant to environmental conditions.

In this study, *Capillaria* spp. and *Eimeria* spp. were the most common spp. in Zay Yar Thi Ri Township. In Katha and Mawlamyaing Townships, the occurrence of *Ascaridia galli* and *Capillaria* spp. were higher than cestodes and protozoan infestations. *Strongyloides* spp. and *Subulura brumpti* were not observed in Nyaung U and Katha Townships. The reason might be due to environmental conditions and geographical differences of sampling sites.

Conclusions and Recommendations

At present, there is very little information on gastrointestinal parasite infestations of village chickens in Myanmar. This study showed the relatively high occurrence of gastrointestinal parasite infestations, with the common species being *Capillaria* spp., *Ascaridia galli*, *Eimeria* spp. and *Raillietina* spp. It is suggested that the levels recorded could lead to production loss of village chickens in the study area. Thus, it is recommended that there is a need for effective control measures for gastrointestinal parasites in village chickens. Moreover, seasonal studies of gastrointestinal parasite infestations should be performed to investigate any seasonal patterns in order to design effective control measures.

Author's Contributions

This research was carried out with the collaboration of all authors. Saw Bawm, Shwe Yee Win and Htet Lin Oo performed sample collection. Shwe Yee Win, Hla Myet Chel, Yu Nandi Thaw and Nyein Chan Soe carried out the laboratory work. Shwe Yee Win wrote the draft of the article. Lat Lat Htun, Saw Bawm and Myint Myint Hmoon checked and corrected the article and suggested the final draft of the article.

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