A study on prevalence of gastrointestinal parasitic infection in hilly chicken at Naikhongchhari upazila of Bandarban district

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List of acronyms and symbols used

Abbreviation	Elaboration
%	Percentage
et al.	And his association
GI	Gastrointestinal
spp.	Species
CVASU	Chattogram Veterinary and Animal Sciences University

Statement of author

I, Belayet Hossain, hereby attest that I have satisfactorily completed all the responsibilities listed in this report. Books, regional and worldwide publications, and other sources were used to collect the data. The required citations have all been made. As a result, I am entirely accountable for gathering, processing, maintaining, and disseminating all information gathered for this report.

The Author

Abstract

Raising poultry is one of the best ways for rural women to make money, especially for marginal and landless farmers. Numerous issues impede the production of poultry, with infectious diseases by parasites being the primary cause. This study was conducted to gather up-to date information on the prevalence of GI parasitic infection in hilly chickens. For this purpose, 100 chicken's fecal samples were collected from the Naikhongchhari upazila of Bandarban district. After 100 samples were examined and the positive case was 19 (19%). This research found that free range chickens (26.23%) were more vulnerable to GI parasitic infection than semi-intensive chickens (7.69%). According to this study, the prevalence of *Ascaridia galli* infection in young chickens under 1 year was 33.33%, while it was 10% or less in chickens 2 or more years old. In chicken weighing 1.2 kg, *Ascaridia galli*, *Heterakis gallinarum*, and *Coopera spp*. were more common. The frequency was lower (10.00%) in chickens weighing 2 kilograms or more. Younger birds have a less developed immune system and are lighter overall, which accounts for this. Regularly dewormed chicken had a lower prevalence (12.66%) of GI parasites than non-dewormed chicken (39.39%). Again, when fenbendazol was used for deworming, the prevalence of GI parasites infection was lower (7.69%), and when levamisole was used, it was higher (18.86%). Therefore, levamisole was less successful than fenbendazol for deworming chickens. Additionally, this study demonstrated that regular feeder and waterer cleaning contributes to a decrease in the incidence of GI parasite infection.

Keywords: *Ascaridia galli*, egg identification, hilly chicken, prevalence, microscopic examination.

Chapter 1: Introduction

Bangladesh is primarily an agricultural country. Small farmers and the majority of rural people in our country make their living from agriculture. The most significant and developed area of Bangladesh's livestock industry is poultry, which attracts both local entrepreneurs and foreign investment. Poultry rearing is one of the most appropriate income generating activities for rural women especially for landless and marginal farmers. Backyard poultry is popular among rural people in Bangladesh, one of the most economically vulnerable and densely populated countries in the world where >40% of the people living below the poverty line (Ferdushy et al., 2016). Poultry meat and eggs contribute with approximately 37% of the total animal protein requirement (Prabakaran, 2003). The demand for chicken products in Bangladesh has increased enormously over time; in 2019, per capita consumption of poultry meat and eggs reached 8.5 kg and 5.1 kg (104 pieces), respectively (Enterprise agency, 2020). In hilly areas of Bangladesh, chickens are reared under different conditions, such as extensive, semi intensive and free-range systems. Scavenging/semi intensive systems are mainly practiced by smallholders in hilly areas, whereas intensive systems are much more organized and are largely used for commercial production (Baig et al., 2006). Smallholders are the primary users of scavenging/semi-intensive systems. Intensive systems are substantially more well-organized and used for commercial production. Chickens are found most of their feed by roaming around the households, where they eat variety of feed items like kitchen waste, leaves, grasses, insects, arthropod, earthworm, ants etc. Poultry production is hindered by many problems among which infectious diseases are most important (Ojok, 1993). In fact, the indigenous chickens of hilly areas in Bangladesh are parasitized by various parasites (Sarkar, 1976). Hilly chicken heavily infected with *Ascaridia galli* which shows signs of diarrhea, weight loss, economic losses etc. are principally associated with mortality and reduction in feed efficiency and egg production. In addition, *Ascaridia galli* is also inferred to work as a vector of *Salmonella spp*. Therefore, it has a significant importance from a public health stand point (Ramadan and Abouznada,1992). Most of the cases, there is found that chickens are infected during early ages and the parasites may be present throughout the production due to not using anti-parasitic drugs and disinfectants in production system. As per my knowledge, Naikhongchhari is an upazila of Bandarban District in the Division of Chattogram where local people are currently expressing interest in raising chickens on hills. Hilly Chicken, a potentially meat-producing fowl genotype found in hilly districts, could be a source of organic white taste meat (Akhter et al., 2018). However,

due to a lack of veterinary services and information, productivity has not increased. Farmers in this area did not deworm their indigenous chickens regularly and were unaware of the presence of parasitism in poultry. Very few studies have been undertaken so far to determine the prevalence of gastrointestinal helminth infection in indigenous chickens in Bangladesh (Rabbi et al., 2006; Ferdushy et al., 2014). Furthermore, a study was done on the frequency of gastrointestinal helminths infection in chickens in Rangamati (Chakma, 2020), but no such studies have been done in Bandarban.

Objectives of the study

i. To know updated information on the prevalence of GI parasitic infection in hilly chickens.
ii. To identify risk factors causing GI parasitic infection in hilly chicken.

Chapter 2: Materials and methods

2.1 Study area and study period

The study was conducted in Naikhongchhari upazila under Bandarban district in April, 2023.

2.2 Sample size

This study examined the presence of GI parasites in 100 fecal samples from hilly chickens that were gathered from different Naikhongchhari households.

2.3 Sample collection and preservation

Using hand gloves, fecal samples were collected for parasitological analyses. It was then stored in plastic container having 10% formalin to allow for the examination to identify parasite eggs and oocysts. Every container had a unique identification number written on it. The samples were then immediately transferred to the Department of Pathology and Parasitology, CVASU and refrigerated at 4℃ for further analyses.

The farmers were asked to provide demographic data about their rearing system, deworming history, clinical symptoms, age, sex, and other details using a structured questionnaire.

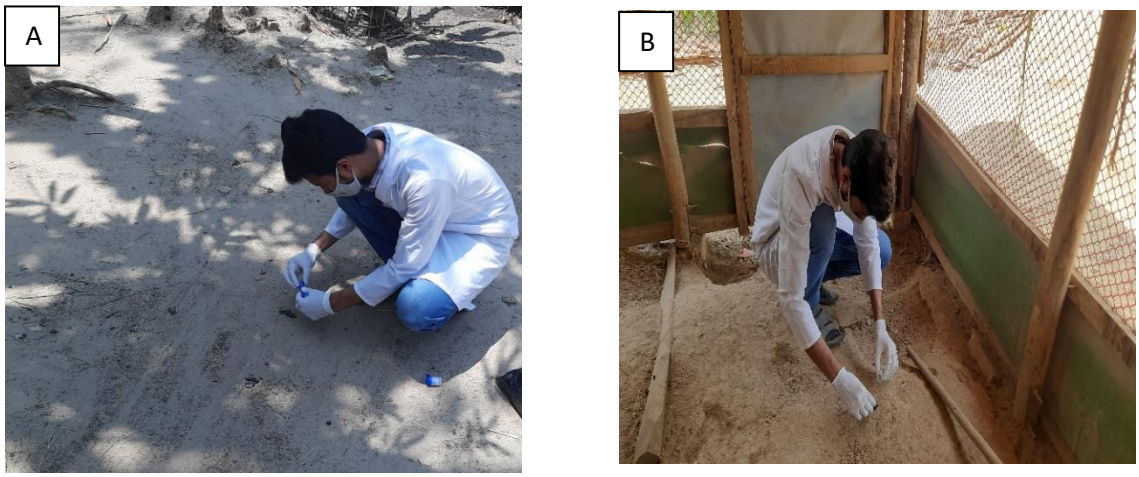

Figure 1: Collection of feces sample from poultry shed (A, B)

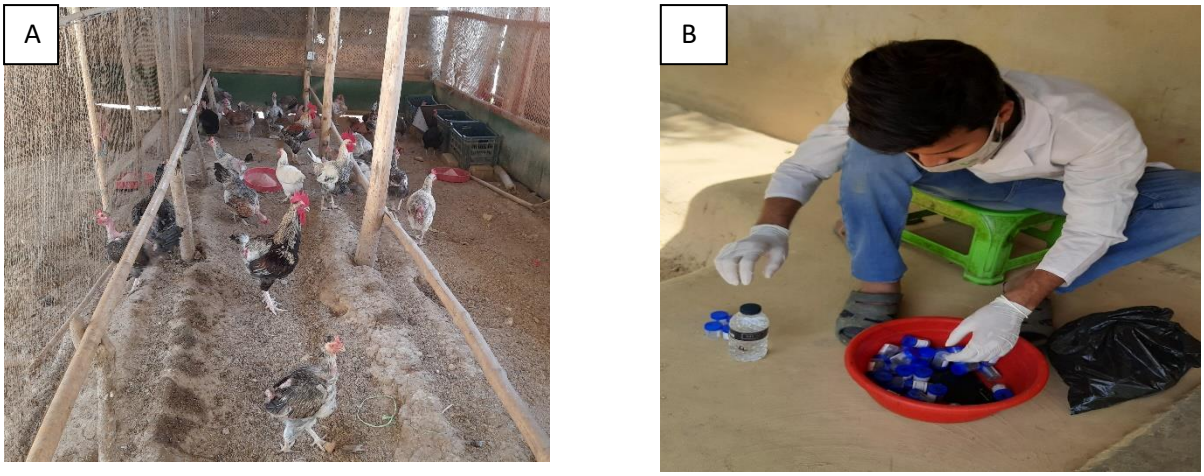

Figure 2: Poultry shed (A) and sampling (B)

2.4 Laboratory examination

The positive samples were screened using the direct smear, floatation, and sedimentation procedures outlined by Urquhart (Urquhart et al., 1996). To determine the parasitic egg load (epg), a modified McMaster counting technique was used (Soulsby, 1982; Tibor, 1999).

Figure 3: Direct smear preparation for microscopic examination (A); Collected sample (B)

2.5 Statistical analyses

Acquired data were statistically managed by MS Excel® and analyzed by using STATA® version 13.

Chapter 3: Result

3.1 Overall prevalence of GI parasitic infection

Total prevalence of GI parasitic infection at Naikhongchhari upazila was 19% where *Ascaridia galli, Heterakis gallinarum,* and *Cooperia spp.* were found in 14%, 4%, and 1% respectively (Table 1).

Table 1: Overall prevalence of GI parasitic infection

Parasite Species	**Frequency (N)**	**Prevalence (%)**	***p*- Value**
Ascaridia galli	14	14.00%	0.302
Heterakis gallinarum	4	4.00%	0.402
Cooperia spp.	1	1.00%	0.303
Total	19	19.00%	0.507

3.2 Prevalence of GI parasites on the basis of rearing system

Ascaridia galli, Heterakis gallinarum, and *Cooperia spp.* were found in 7.69%, 0.00%, and 0.00% of semi-intensive rearing systems, respectively, whereas they were found in 18.03%, 6.56%, and 1.64% of free-range rearing systems. In comparison to semi-intensive systems, the overall prevalence of GI parasites was higher in free-range rearing systems (26.23%) (Table 2).

Table 2: Prevalence of GI parasites on the basis of rearing system

Species of parasites	**Rearing systems % (N)**		***p*- Value**
	Semi intensive (%)	Free range (%)	
Ascaridia galli	7.69% (3)	18.03% (11)	0.146
Heterakis gallinarum	0.00% (0)	6.56% (4)	0.103
Cooperia spp.	0.00% (0)	1.64% (1)	0.422
Total prevalence	7.69% (3)	26.23% (16)	0.467

3.3 Prevalence of GI parasites according to age of chicken

Prevalence of *Ascaridia galli, Heterakis gallinarum,* and *Cooperia spp*. in chicken under one year was 33.33%, 7.50%, and 1.00%, respectively, however in chicken 1.5 years or older, the corresponding prevalence was 10%, 0.00%, and 0.00%. In chickens of 2.5 years of age or older, the prevalence of *Ascaridia galli, Heterakis gallinarum,* and *Cooperia spp*. was 7.69%, 4.76%, and 0.00%, respectively. Overall GI parasites were more common in young chickens under a year old (41.83%) (Table 3).

Table 3: Prevalence of GI parasites according to age of chicken

Species of parasites	**Average Age % (N)**			***p*- Value**
	1 year or less	1.5 years or more	2.5 years or more	
Ascaridia galli	33.33% (7)	10.00% (4)	7.69% (3)	0.015
Heterakis gallinarum	7.50% (3)	0.00% (0)	4.76% (1)	0.231
Cooperia spp.	1.00% (1)	0.00% (0)	0.00% (0)	0.469
Total prevalence	41.83% (11)	10.00% (4)	12.45% (4)	0.589

3.4 GI parasites prevalence according to body weight of chicken

In chickens weighing 1.2 kg or more, the prevalence of *Ascaridia galli, Heterakis gallinarum,* and *Cooperia spp.* was 33.33%, 7.50%, and 2.50%, respectively, but in chickens weighing 2 kg or more, the prevalence was 10.00%, 0.00%, and 0.00%, respectively. In chicken weighing 2.5 kg or more, the prevalence of *Ascaridia galli, Heterakis gallinarum,* and *Cooperia spp.* was 7.69%, 4.76%, and 0%, respectively. The overall prevalence of gastrointestinal parasites was greater in young chickens weighing 1.2 kg or more (43.33%) (Table 4).

Table 4: GI parasites prevalence according to body weight of chicken

Species of parasites	**Average body weight (kg) % (N)**			***p*- Value**
	1.2 kg or more	2 kg or more	2.5 kg or more	
Ascaridia galli	33.33% (7)	10.00% (4)	7.69% (3)	0.015
Heterakis gallinarum	7.50% (3)	0.00% (0)	4.76% (1)	0.231
Cooperia spp.	2.50% (1)	0.00% (0)	0.00% (0)	0.469
Total prevalence	43.33% (11)	10.00% (4)	12.45% (4)	0.589

3.5 Prevalence of GI parasites on the basis of deworming status of chicken

In non-dewormed chicken, the prevalence of *Ascaridia galli*, *Heterakis gallinarum*, and *Cooperia spp.* was 33.33%, 4.76%, and 1.27%, respectively, whereas in dewormed chicken, the prevalence of *Ascaridia galli*, *Heterakis gallinarum*, and *Cooperia spp.* was 8.86%, 3.80%, and 0.00%, respectively. Dewormed chicken had a reduced prevalence (12.66%) of GI parasites than non-dewormed chicken (39.39%) (Table 5).

Table 5: Prevalence of GI parasites on the basis of deworming status of chicken

Species of parasites	Deworming (During last 3months) % (N)		*p*- Value
	Non-dewormed	Dewormed	
Ascaridia galli	33.33% (7)	8.86% (7)	0.004
Heterakis gallinarum	4.76% (3)	3.80% (1)	0.841
Cooperia spp.	1.27% (1)	0.00% (0)	0.604
Total prevalence	39.39% (11)	12.66% (8)	0.687

3.6 Prevalence of GI parasites based on anthelmintic used

The prevalence of *Ascaridia galli, Heterakis gallinarum, and Cooperia spp.* in chickens dewormed with Fenbendazol was 7.69%, 0.00%, and 0.00%, respectively; in chickens dewormed with Levamisole, the prevalence of *Ascaridia galli, Heterakis gallinarum,* and *Cooperia spp*. was 8.86%, 7.50%, and 2.50%, respectively. Total prevalence of GI parasitic infection in case of fenbendazol was 7.67% and in case of Levamisole it was 18.86% (Table 6).

Table 6: Prevalence of GI parasites based on anthelmintic used

Species of parasites	Used Anthelmintic % (N)		*p*- value
	Fenbendazol	Levamisole	
Ascaridia galli	7.69% (3)	8.86% (4)	0.015
Heterakis gallinarum	0.00% (0)	7.50% (3)	0.231
Cooperia spp.	0.00% (0)	2.50% (1)	0.469
Total prevalence	7.69% (3)	18.86% (8)	0.675

3.7 Prevalence of GI parasites based on daily cleaning of waterer and feeder

When the waterer and feeder are cleaned every day, the prevalence of *Ascaridia galli, Heterakis gallinarum,* and *Cooperia spp*. was 7.69%, 0.00%, and 0.00%, respectively. In contrast, the comparable prevalence was 8.86%, 7.50%, and 2.50%, respectively, in chickens whose waterer and feeder are not cleaned on a regular basis. The prevalence was 7.69% in case of daily cleaning waterer and feeder while it was 26.20% in irregularly cleaned waterer and feeder (Table 7).

Table 7: Prevalence of GI parasites based on daily cleaning of waterer and feeder

Species of parasites	**Daily cleaning waterer and feeder % (N)**		***p*- Value**
	Yes	No	
Ascaridia galli	7.69% (3)	18.00% (11)	0.146
Heterakis gallinarum	0.00% (0)	6.56% (4)	0.103
Cooperia spp.	0.00% (0)	1.64% (1)	0.422
Total prevalence	7.69% (3)	26.20% (16)	0.570

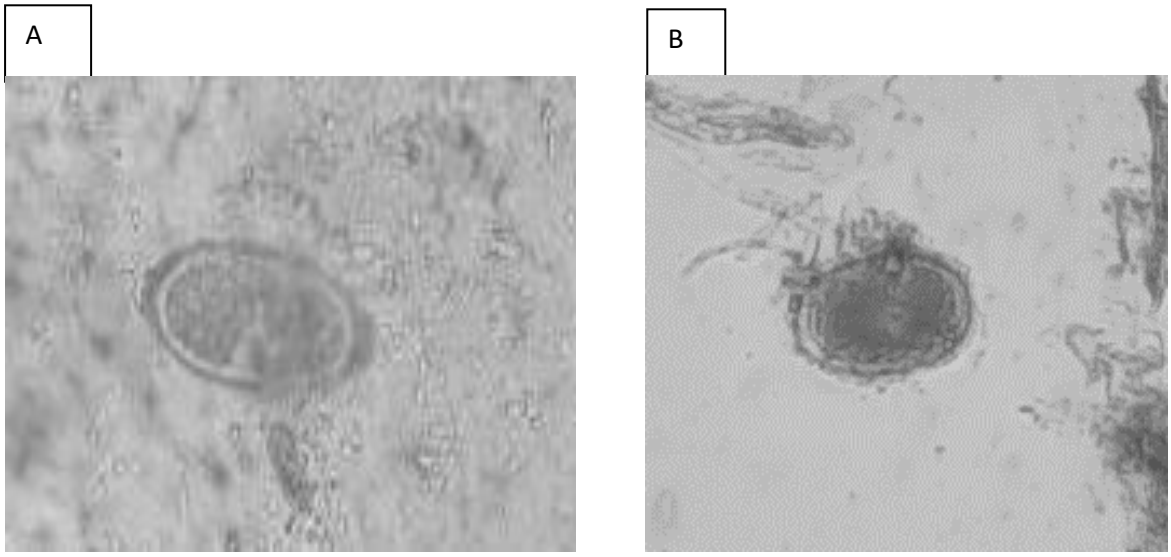

Figure 4: Egg of *Heterakis gallinarum* (A); Egg of *Ascaridia galli* (B);

3.8 Results of Mc Master Technique

According to the study, hilly chicken had moderate epg (300) which indicate moderate infection with GI parasites (Table 8).

Table 8: Results of Mc Master Technique

Study area	Average epg (Egg per gram of feces)
Naikkhongchhari (Hilly chicken)	300

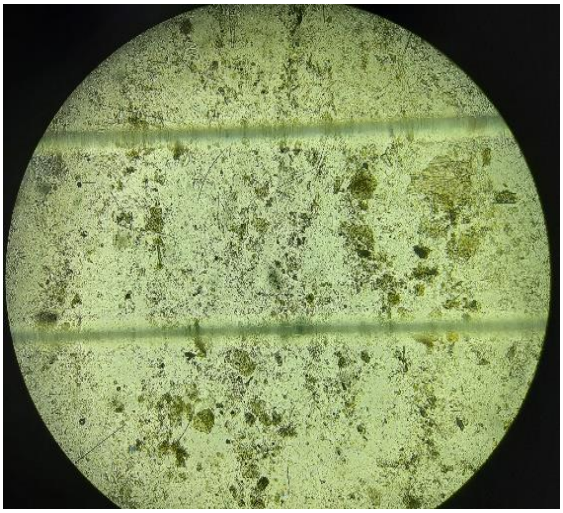

Figure 5: Parasitic egg in McMaster technique (C)

Chapter 5: Discussion

In accordance with the findings of this study, 19% of 100 hilly chickens were infected with gastrointestinal parasites. Our research found that free range chickens were more vulnerable to GI parasitic infestation than semi-intensive chickens. Other recent research seems to back up this theory (Sparagano and Ho, 2020). Young chickens are more susceptible to parasite invasion in the GI tract. According to this study, the prevalence of *Ascaridia galli* infection in young chickens under 1year was 33.33%, while it was 10% or less in chickens 2 or more years old. This is due to their undeveloped immune system. In chicken weighing 1.2 kg, *Ascaridia galli*, *Heterakis gallinarum*, and *Coopera spp*. were more common. The frequency is lower in chickens weighing 2 kilograms or more. Younger birds have a less developed immune system and are lighter overall, which accounts for this. Regularly dewormed chicken had a lower prevalence of GI parasites than non-dewormed chicken. Again, when fenbendazol was used for deworming, the prevalence of GI parasites infestation was lower, and when levamisole was used, it was higher. Therefore, levamisole was less successful than fenbendazol for deworming chickens. Additional recent research lends support to this concept (Soudkolaei et al., 2021). Additionally, this study demonstrated that regular feeder and waterer cleaning contributed to a decrease in the incidence of GI parasite infection.

Limitation

Low positive case count made it challenging to obtain enough adult worms in time to complete this experiment correctly. We were only able to perform microscopic examinations in the limited period of time that was available.

Conclusion

The most significant and developed area of Bangladesh's livestock industry is poultry, which attracts both local entrepreneurs and foreign investment. The demand for chicken products in Bangladesh has increased enormously over time. This study was conducted to gather up-to date information on the prevalence of GI parasitic infection in hilly chickens. For this purpose, 100 chicken’s feces were collected from the Naikhongchhari upazila in Bandarban. After 100 samples were examined, the disease was found in 19 of them. The prevalence of was 19%. The incidence of GI parasite infection in chickens can be decreased by using a semi-intensive rearing design, routine deworming, frequent feeder cleaning, a strengthened immune system, and other measures. Further study is required to find crucial details for an improved hilly chicken management plan.

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The Author.

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Biography of author

Belayet Hossain is the son of late Delowar Hossain and Razzaber Nesa. He is an intern veterinarian at Chattogram Veterinary and Animal Sciences University (CVASU)'s Faculty of Veterinary Medicine (FVM). He completed the Higher Secondary Certificate (HSC) examination from the Chittagong board in 2017 after passing the Secondary School Certificate (SSC) examination from the Comilla board in 2015. He hopes to conduct future study on zoonotic diseases and animal welfare issues that affect public health in the nation as a whole.