Gastrointestinal Parasitic Infection in Wild Herbivores at Chattogram zoological Park, Bangladesh

A clinical report submitted by:

Name: Abu Bakkar Siddique

Roll No: 15/25

Reg. No: 01440

Intern Id: 23

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Chattogram Veterinary and Animal Sciences University, Khulsi, Chattogram-4225, Bangladesh

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Submitted by:	Approved by:
…….	……
Abu Bakkar Siddique	Dr. Pranab Paul
Roll :15/25	Assistant Professor
Regi: 01440	Dept. of Medicine and surgery
Intern ID: 23	

Chattogram Veterinary and Animal Sciences University Khulsi, Chattogram-4225, Bangladesh

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ABSTRACT

A coprological study was undertaken to identify gastrointestinal parasites and their prevalence in wild herbivores animal housed at Chattogram zoological park. Among thirty-nine animals of six different herbivore species 20 fecal samples were collected randomly that cover all the species. After performing different standard qualitative parasitological investigation, it was found that about 70% of herbivore animals were infected with intestinal parasites of which 55% infected with helminthes and 15% infection were due to protozoa. The helminthes that was detected from different herbivore animals were of *Paramphistoimum spp, Schistosoma spp, Strongylus spp, Fasciola spp, Trichonema spp.* Only *Balanditium spp identify as protozoa* in sambar deer and zebra. *Paramphistomum spp* was most commonly observed parasite between various animals. Majority of the species infected with multiple parasites. Routine coprological screening may help to identify different parasite and selection of anthelmintic drugs which in turns assist the zoo management in the formulation and implementation of preventive and control measures against the spread of infectious parasitic diseases among animals within the zoo.

Chapter-1

INTRODUCTION

Zoological garden (Zoo) are an *ex-situ* form of conservation where animals are displayed in cages or enclosures for esthetic, educational or research, and conservation purposes (Thawait et al., 2014). Zoological gardens play an important role in the promotion of animal biodiversity by protecting endangered species (Kelly, J.D. and English, A.W., 1997). In Bangladesh, a few zoological gardens, safari parks and eco parks have been established which act as an important source of recreation for people of all ages (Khatun et al., 2014). Chattogram zoo is one of them. Since animals are kept in confined areas, parasitic diseases constitute one of the major problems in zoological gardens around the world due to high environmental contamination (Rao, A.T. and Acharjyo, L.N., 1984). In wild conditions, animals have some natural resistance against parasitic diseases and there is a state of equilibrium between the parasite and the host and it seldom lead to harmful infection unless stressed (Gaur et al., 1979).Unlike in the wild, stress conditions caused by captivity can diminish the resistance to parasite diseases (Geraghty et al., 1981) (Gracenea et al., 2002)(Cordón et al., 2008).Occurrence of parasites in captive animals in zoological gardens might vary according to husbandry practices, disease prophylactic measures, parasite-host interactions and treatment administrated (Lim et al., 2008). Parasites can be brought into a zoological garden by many ways through animal food, (contaminated fruits and vegetables, infected meat or fish, etc), intermediate and paratenic hosts (snails, ants, cockroaches and other insects, rodents, etc.), newly acquired parasitized animals and through infected zoo staff and visitors (Panayotova-Pencheva, M.S., 2013). Parasites and infectious diseases have become a major concern in conservation of endangered species as they can lead to mortality, dramatic population declines, and even contribute to local extinction events (Aguirre et al., 2007) (Wisely et al., 2008) (Smith et al., 2006). Even occasionally causing sudden local fatalities (Oguge et al., 2005). Usually, captive animals in the zoo do not show alarming signs of parasitism if deworming is carried out regularly (Parsani et al., 2001). Until this date only few detailed and comprehensive studies have been conducted on the prevalence of the gastrointestinal parasites in animals housed in these facilities. Therefore, this study attempts to determine the occurrence and prevalence of gastrointestinal parasites in herbivores zoo animals at Chattogram Zoo in Bangladesh.

Chapter-2

MATERIALS AND METHODOLOGY

2.1 Study period and site: This study was conducted during August and September 2019 at Chattogram Zoo which is located at Chattogram, in Bangladesh. It is the small zoo and was established in 1988, comprises an area of 6 acres. The collected samples were examined in parasitology laboratory of Department of pathology and parasitology, Chattogram veterinary and animal sciences University.

2.2 Target population: The Chattogram zoo. It houses a total number of over 320 animals including mammals' reptiles and birds. The study included only herbivores animals housed at the zoo. A total of 20 samples were collected from different herbivores mammals at the zoo. The list of the animal given bellow at Table 1.

Table 1. List of animals from which sample were collected.

Common name	No. of animals	No of samples collected
Spotted deer (*Axis axis*)	15	4
Sambar deer (*Cervus unicolor*)	6	4
Barking deer (*Munticus muntjac*)	2	2
Zebra (*Equus quagga*)	6	4
Goyal (*Bos frontalis*)	2	2
Horse *(Equus caballus*)	8	4

2.3 Collection and preservation of samples: Fresh fecal sample were collected from the animal cases with the assistance of the animal caretakers. The sample were collected from the ground feces immediately after defecation by animals and transferred to a collection vial containing 10% formalin. During collection of the samples special attention was paid to prevent any type of contamination. About 50 grams of feces were collected from each animal. Basic information and important history of related individual animal were recorded through a proper questionnaire. Immediate after collection samples were brought to the laboratory through maintaining a proper chain and were stored at 4°C until analysis.

2.4: The sample was examined in the parasitology laboratory of Department of pathology and parasitology at Chattogram veterinary and animal sciences University. Eggs, ova, cysts, oocyst of different parasites were identified according to the morphology by performing direct smear, sedimentation and flotation technique.

2.5 Direct smear technique: A small quantity of feces was taken on a clean microscope slide and a few drops of water were added to it. A coverslip was placed over the smear and examined under the microscope to observe the morphology of eggs, cysts of parasite (Soulsby, E.J.L., 1982).

2.6 Sedimentation technique: Approximately 3 g of feces was transferred into a container and pour 40-50 ml of tap water into it. Then it was mixed thoroughly. After filtration the filtered material was taken to a test tube and the supernatant was removed carefully with a pipette. Then allow it to settle down for five minutes and again the supernatant was discarded carefully. A small drop of sediment was transferred to a microscope slide using a pipette. Then a coverslip was placed and examined under a microscope at 40x magnification (Soulsby, E.J.L., 1982).

2.7 Flotation technique: The method was done by using Saturated salt solution which Specific gravity was 1.18 - 1.20 prepared by Sodium chloride: 400 grams and water: 1000 ml. Approximately 3g of feces was transferred into a container and pour 50 ml of flotation fluid into container. Feces and flotation fluid were mixed thoroughly then the fecal suspension was poured through sieve into container. Then the fecal suspension was poured into test tube supported in a stand. Then the test tube was gently topped off with the suspension leaving a convex meniscus at the top of the tube. A coverslip was placed on top of the test tube. The test tube was kept to stand for 20 minutes. The coverslip was removed off the test tube together with the drop of fluid adhering to it. Then the coverslip was placed on a clean slide and examined under a microscope at 40x and 100x magnification (Soulsby, E.J.L., 1982).

Chapter-3

RESULTS

A total of 20 fecal samples of different herbivorous animals were examined for the presence of gastrointestinal parasites. The overall prevalence of parasitic infection was 70% (14/20) with 55% (11/20) of helminth infections and 15% (3/20) of protozoic infections. Results indicated that helminths infections were more common than protozoic infections herbivores (Table 2). At least one intestinal parasite was identified in the fecal sample of each species except barking deer. Only *paramphistomum sp*.25%1(4) Parasite identified in spotted deer. *Paramphistomum sp*. *Schitosoma sp. Balanditium sp.* 100% 4(4) Parasites were identified in sambar deer. *Strongylus sp.*and *Balantidium sp.* 100% 4(4) were identified in zebra. *Facsiola sp*.and *Paramphistomum sp.*100% 2(2) was identified in goyal. *Strongylus sp.* and *Trichonema sp*.75% 3(4) were identified in horse (Table 3). Mixed infection was observed in tow species, including sambar deer *(Paramphistomum sp.+ Moniezia expansa)* in one sample and *(Schistosoma + Balantidium)* on another sample. In Zebra (*Strongyloides* sp.+ *Coccidia*) (Table 4).

Table 2. Overall prevalence of gastrointestinal parasites in captive herbivores animals at Chattogram Zoo.

Name of the animals	No. of sample examined	No. of positive sample			Prevalence (%)	
		Helminth	Protozoa	Total	Helminth	Protozoa
Spotted deer	4	1	0	0	25	0
Sambar deer	4	4	1	4	100	25
Barking deer	2	0	0	0	0	0
Zebra	4	2	2	4	50	50
Goyal	2	2	0	2	100	0
Horse	4	3	0	3	75	0
Total	20	11	3	14		

Table 3. Prevalence of different gastrointestinal parasites in captive herbivores animals at Chattogram Zoo.

Name of animal	Name of the parasite	No. of positive case (No of sample)	Prevalence (%)
Spotted deer	*Paramphistomum sp.*	1(4)	25
Sambar deer	*Paramphistomum sp.*	3(4)	75
	Schistosoma sp.	1(4)	25
	Balantidium sp.	1(4)	25
Barking deer	*Negative*	0(2)	00
Zebra	*Strongylus sp.*	2(4)	50
	Balantidium sp.	2(4)	50
Goyal	*Fasciola sp.*	1(2)	50
	Paramphistomum sp.	1(2)	50
Horse	*Trichonema sp.*	1(4)	25
	Strongylus sp.	2(4)	50

Table 4. Mixed infection recorded in captive herbivores animals at Chattogram Zoo.

Name of animals	Parasites	No. of case	Prevalence (%)
Sambar deer	*Paramphistomum sp. + Moniezia expansa*	2(4)	50
	Schistosoma + Balantidium		
Zebra	*Strongylus sp.+ Balantedium sp.*	2(4)	50

Figure: 1

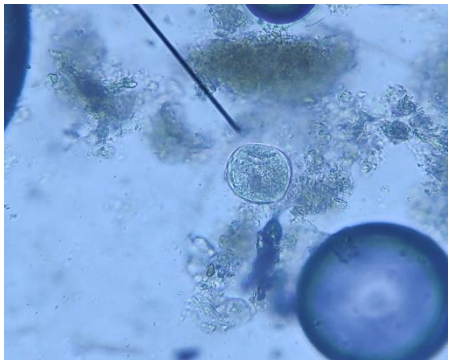

Fig:1.1 Cyst of *Balantidium sp.*

Fig: 1.2 Egg of *Moniezia sp.*

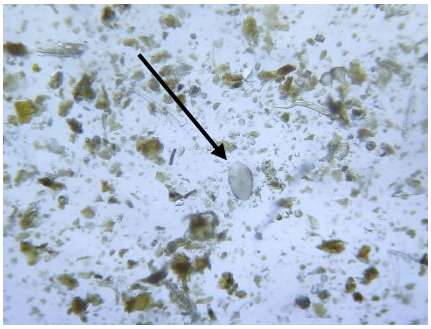

Fig:1.3 Egg of *Paramphistomum sp.*

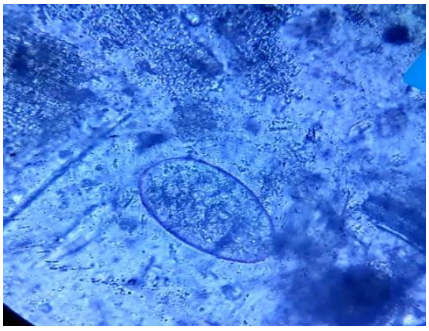

Fig:1.4 Egg of *Fasciola sp.*

Fig:1.5 Egg of *Schistoma sp.*

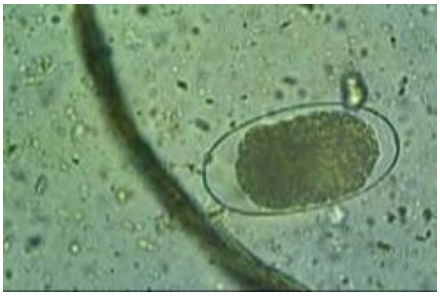

Fig:1.6 Egg of *Trichonema sp.*

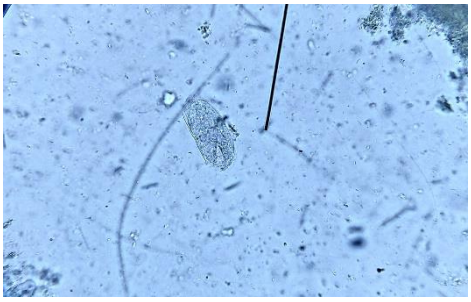

Fig:1.7 Egg of *Strongylus sp.*

DISCUSSIONS

During this study, a total of 20 fecal sample in deer were examined, of which 14 (70%) were found to be infected with one or more species of gastrointestinal parasites. These findings support the earlier report which overall prevalence 69.29% (B. C. Barmon et al., 2014). But higher prevalence 76.6% reported (Opara et al., 2010). The prevalence of helminth infections was higher than the prevalence of protozoic infections, an observation also confirmed in other studies (MM Khatun et al.,2014). In this study 25% of the spotted deer were positive for gastrointestinal parasites, which is lower than the prevalence recorded by MM khatun et al. 2014 (43.5%). The spotted deer were found 25% positive for *Paramphistomum sp*. This is higher than the rate of *Paramphistomum sp.* infection in deer recorded by B.C. Barmon et al.,2014 (20.47%). This difference might be due to location of animal cages, availability of intermediate hosts near the cages and the source of feeds. In sambar 75% deer positive for *Paramphistomum sp.* 25% of sambar deer were found positive for *Schitosoma sp.* and 25% *Balantidium coli* was recorded, which was different from other studies (Singh et al. 2009), which found a large number of gastrointestinal parasites including strongyles, *Strongyloides* sp., *Coccidia, Fasciola sp*. This difference might be due to location difference, the number of samples examined and the housing and feeding management of the zoo. No parasite found in barking deer which in contradict with (Aviruppola et al.,2016) He found tapeworm *Moneizia sp*. on barking deer. It has been recorded that 20% zebra infected by *Crytosporidium sp.* and 80% by hookworm in Malaysia zoo (Yal Lim et al.,2008). But in this study 50% zebra infected with hookworm and 50% with Balantidium sp. This difference might be due to the number of samples examined and the housing and feeding management of the zoo.In this study 50% of goyal positive in *Fasciola sp* and 50% *Paramphistomum sp* this result completely contradict with (Yal Lim et al.,2008). He found only hookworm in goyal at Malaysia zoo. This difference might be due to climatic difference and difference on presence of intermediate host. 25% horse infected with *triconema sp.* and 50% horse infected with hookworm *strongylus sp.* which is lower than (Yal Lim et al.,2008) (66.7%). But he was not found *Triconema sp.* This difference might be due to location difference, and the source of feeds.

Chapter-5

CONCLUSIONS

This study indicated the importance of monitoring levels of parasitic infections in zoological garden. The present study has found that 70% of herbivorous animal were infected with intestinal parasites. The results of this study showed that even with high standards of husbandry at Chattogram zoo with regular fecal examinations by the Veterinary Laboratory there remains a detectable level of parasitic infection. It is felt that if standards were lowered or husbandry or examination levels were relaxed a higher degree of infection would become evident. The intestinal parasites recorded in this study are known to be of human pathogenic importance as potential source for zoonotic transmission between animal and human especially among animal handlers.

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