



Prevalence Of Gastro-Intestinal Parasites in Captive Spotted Deer (*Axis Axis*) Of Zoos And Parks In And Around Bhubaneswar, Odisha

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ABSTRACT

The present investigation was undertaken to study the gastro-intestinal parasites in captive Spotted Deer at Nandankanan Zoological Park, Raj Bhawan Deer Park (Bhubaneswar) and Tulasipur Deer Park (Cuttack) of Odisha. A total of 292 faecal samples were collected from three different captive locations during the study period of Oct-2015 to May-2016. The overall incidence of gastro-intestinal parasitic infection was 75.3%. Paramphistomum spp. and strongyle spp. were mostly prevalent in deer. No cestode or protozoan cyst/oocyst or coccidian infection recorded in this investigation. Mixed infection was found more common than single infection with a prevalence of 26.8%. Seasonal investigation revealed a higher prevalence rate of gastro-intestinal parasites in winter (77%) than in summer (73.5%). The gastro-intestinal parasitic infection was recorded higher in male (83.6%) than in female deer (80%).

KEYWORDS: Nandankanan Zoological Park, Captive deer, Gastro-intestinal parasites, prevalence.

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INTRODUCTION

Wildlife found in all ecosystems, like rainforests, deserts, plains and urban areas (zoos and parks) plays a significant role in maintaining the ecological equilibrium of nature. The creation of series of National Parks, Sanctuaries aim at wildlife conservation which ultimately protects various wild flora and fauna species and their habitats. Parasitic diseases represent a major concern in captive wild animals for the high environmental contamination due to maintenance of animals in confined areas, resulting in loss of condition, reduced body weight gain, reproductive disorder and ultimately death. In Zoos and Zoological Parks, among all herbivores, the Axis or Spotted Deer (*Axis axis*) is the most beautiful and abundant cervid species in India [1]. In captivity wild animals usually are at a risk to succumb to parasitic infection due to environmental stress like change in living conditions and space limitations [2, 3]. A wide range of parasitic spp. have been recorded which not only affects the animal health adversely but sometimes cause mortality, morbidity or both [4]. Usually, captive animals don't show alarming signs of parasitism if regular deworming practices carried out in the zoo [5]. Infections with helminthes are a major health issue in captive and wild deer [6] mainly where herds of animals are kept in relatively small enclosures. A regular programme of gastro-intestinal parasites surveillance and control measures based on proper diagnosis, effective treatment and prophylaxis measures would be helpful to improve and progress the health of captive zoo animals. Considering the economic significance of gastro-intestinal parasites in spotted deer (*Axis axis*) kept at the three different locations in and around Bhubaneswar, i.e at Nandankanan Zoological Park, Raj Bhawan Deer Park and Tulasipur Deer Park, Cuttack, the present investigation has been undertaken to study the prevalence of gastro-intestinal parasites in spotted deer.

The present paper also reports the seasonal and sex wise variation in prevalence of gastro-intestinal parasites in captive spotted deer kept at these three different locations.

MATERIALS AND METHODS

A total of two hundred ninety two (292) fresh faecal samples were collected from all the ages and both the sex of spotted deer of three selected locations viz; Nandankanan Zoological Park, Raj Bhawan Deer Park and Tulasipur Deer Park, Cuttack for the period Oct-2015 to May-2016 and examined for the prevalence of gastro-intestinal parasites. For study of sex wise variation in prevalence of gastro-intestinal parasites, faecal samples from male and female spotted deer were collected separately from their respective enclosures of Nandankanan Zoological Park. The collected faecal samples were immediately preserved in 10% formalin. Then the samples were subjected to detail routine parasitological analysis for the presence of parasitic eggs/oocysts by direct smear examination, standard sedimentation and flotation techniques. The ova/larvae/oocyst/cyst of different parasites were identified as per the morphology and morphometry and quantitative estimation done by using modified Stoll's ova dilution techniques and Mc Master technique to determine eggs per gram (EPG) oocyst per gram (oocyst) and cyst per gram (CPG) of faeces [7]. The data regarding the effect of sex and season on prevalence of gastro-intestinal parasites were subjected to statistical analysis. Statistical analysis was carried out by Statistical Package for Social Science (SPSS) using Chi Square test.

RESULTS AND DISCUSSION

Out of a total of 292 faecal samples of captive spotted deer of three different selected locations examined, 202 (75.3%) were found to be positive for gastro-intestinal helminths, which is in conformity with the earlier findings [8-10]. The presence of gastro-intestinal nematodiasis in captive deer supports the earlier research reports from different parts of the world. [11-16]]. During the present study, no cestode or protozoan parasites were recorded in captive spotted deer which was similar with the finding from Nagpur [4].

The present study also revealed that the prevalence of gastro-intestinal parasitic infection was highest at Nandankanan Zoological Park 82.2% (97/118), followed by Raj Bhawan Deer Park 7.90% (75/95), and Tulasipur Deer Park 60.7%(48/79) Cuttack. The Chi-square test showed a statistically significant ($p < 0.05$) rate of variation in the prevalence of gastro-intestinal parasites in between Nandankanan Zoological Park and Tulasipur Deer Park ; Raj Bhawan Deer Park & Tulasipur Deer Park were while a non-significant variation was observed between Nandankanan Zoological Park & Raj Bhawan Deer Park (Table - 1).

An overall prevalence of 25.3% trematode and 23.2% nematode, while mixed infection of 26.8% were recorded during the study (Table -2). A mixed infection of *Paramphistomum* and *Strongyle sp.*(n=72), *Paramphistomum* and *Strongyloides sp.*(n=4), *Fasciola sp* and *Strongyle sp.*(n=1), *Paramphistomum* and *Fasciola sp.* (n=1) with the prevalence rate of 24.7%, 1.4%, 0.4% and 0.4% respectively were observed during the study (Table - 3). Mixed infection of *Paramphistomum sp.* and *Strongyle sp.* was found more common in captive spotted deer which was also reported at Dhaka National Zoological garden and Char kukri Mukri in Bhola District, Bangladesh [8, 17].

During the study, overall prevalence of two types of trematode (25.3%) and two types of nematodes (23.2%) were observed and a high rate of prevalence was recorded for *Paramphistomum sp.* (51.8%) followed by *Strongyle sp.* (48.3%), *Strongyloides sp.* (1.4%) and *Fasciola sp.* (0.6%) (Table-4). High prevalence of *Paramphistomum sp.* in captive spotted deer has been previously confirmed in Bangladesh(8) and in Thiruvananthapuram Zoological garden, Kerala [11], Maharajbag zoo, Nagpur [18], South Uttaranchal [9] and Mahendra Choudhury Zoological Park, Punjab [19]. Single infection of *Strongyle sp.* was common in captive spotted deer which is in conformity with previous studies [19, 20]. The lower detection of *Fasciola sp.* in this study has also been supported by studies in deer at Bangladesh and around Jabalpur [8,21] with a prevalence rate of 6.7% & 8.6% respectively. More or less similar incidence of *Strongyloides sp.* have been documented earlier [11, 12, 22, 23].

Seasonal investigation revealed a higher prevalence rate of gastro-intestinal parasites in winter (77%) than in summer (73.5%). It was noted that the incidence of helminth parasites in Axis deer touched its peak during winter followed by summer season, which can be attributed to the fact that after rains and during winter the atmosphere is conducive for increased pasture contamination, development of infective larvae and increased load of parasites. In winter season, prevalence was relatively higher in case of *Strongyle sp.* (50.0%) followed by *Paramphistomum sp.* (49.3%), *Strongyloides sp.* (27%) and *Fasciola sp.* (1.4%), while in summer season, prevalence was higher in case of *Paramphistomum sp.* (54.3%) followed by *Strongyle sp.* (45.7%) (Table 5). Report of this study was in conformity with the

findings in the scrub forest in western Vidharbha region of Maharashtra (24). A higher incidence of helminthic infection has been reported in winter & rainy season in Axis deer from Nagpur [25].

This research study, also revealed a relatively higher incidence of gastro-intestinal parasitic infection in male (83.6%) than in female deer (80%) at Nandankanan Zoological Park but with no statistical significance. This finding was similar with the report from Central Spain(14) and Jallo wildlife park, Lahore [2].

Our investigation concluded that Spotted deer of either sex, irrespective of seasons in these three captive locations in and around Bhubaneswar were found infected with varieties of gastro-intestinal parasites without showing any outward physiological signs of infection. It can be zoonotically very important because these animals may be serving as reservoir hosts for gastro-intestinal parasites that are pathogenic to man. The present investigation suggest that further a long term epidemiological study of gastro-intestinal parasitic infection is highly essential for a better understanding of parasitism in detail and to ensure better management and adaptation of best possible ways of control measures to prevent the reoccurrence of existing infection in spotted deer in zoos and parks.

Table 1. Prevalence of gastro-intestinal parasites in captive Spotted Deer in three different selected locations

Serial No	Locations	Number of faecal samples examined	Number of cases found positive	Prevalence (%)
1.	NZP	118	97	82.2% ^a
2.	RBDP	95	75	79.0% ^a
3.	TDP	79	48	60.7% ^a

N:B:- Prevalence (%) bearing different superscripts differs significantly at 5% (P<0.05).

*NZP= Nadankanan Zoological Park, RBDP= Raj Bhawan Deer Park, TDP= Tulasipr Deer Park

Table 2. Prevalence of gastro-intestinal parasites in captive Spotted deer in and around Bhubaneswar

Serial no	Type of infection	No. of positive Cases	Prevalence %
1.	Nematode(single)	68	23.2%
2.	Trematode(single)	74	25.3%
3.	Mixed infection	78	26.8%

Table 3. Prevalence of mixed infection in captive Spotted deer in and around Bhubaneswar

S no.	Type of mixed infection	No. of cases found	Prevalence %
1.	<i>Paramphistomum</i> sp. and <i>Strongyle</i> sp.	72	24.7%
2.	<i>Paramphistomum</i> sp. and <i>Strongyloides</i> sp.	4	1.4%
3.	<i>Fasciolasp.</i> and <i>Strongyle</i> sp.	1	0.4%
4.	<i>Paramphistomum</i> sp. and <i>Strongyle</i> sp.	1	0.4%
	Total	78	26.8%

Table 4: Gastro-intestinal parasites identified in the faecal samples of Spotted deer (*Axis axis*) in and around Bhubaneswar

Serial no.	Type of gastro-intestinal parasites	Total no. of samples examined	No. of positive cases	Prevalence %
1.	<i>Strongyles</i> spp.	292	141	48.3%
2.	<i>Paramphistomum</i> sp.	292	151	51.8%
3.	<i>Strongyloides</i> sp.	292	4	1.4%
4.	<i>Fasciola</i> sp.	292	2	0.6%

Table 5: Seasonal prevalence of gastro-intestinal parasites in captive Spotted deer (*A. axis*) at three captive locations. (N=292)

Serial no.	Name of parasites	Summer (n=140)		Winter (n=152)	
		No. infected	Prevalence %	No. infected	Prevalence %
1.	<i>Strongyle</i> spp.	64	45.7%	77	50.7%
2.	<i>Paramphistomum</i> sp.	76	54.3%	75	49.3%
3.	<i>Strongyloides</i> sp.	-	-	4	2.7%
4.	<i>Fasciola</i> sp.	-	-	2	1.4%

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