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Gastrointestinal Parasitic Infection in Captive Herbivores of Kanan Pendari Zoo, Bilaspur, Chhattisgarh

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A B S T R A C T

The present study was undertaken to study the prevalence of gastro-intestinal parasites (GIP) in captive wild herbivores housed in Kanan Pendari Zoo (KPZ), Bilaspur, Chhattisgarh. A total of 226 faecal samples were examined by direct, sedimentation, floatation method and Mc master technique. The overall prevalence of gastro-intestinal parasites in captive wild herbivores was reported to be 28.31%. Seasonal prevalence was reported to be 26.00% in summer season and 30.15% in pre-monsoon season. Amongst all species of captive wild herbivores studied, Blue bull showed highest prevalence (75.00%) of GI parasites. During the study, prevalence of trematodes was 42.18%, nematodes was 51.56% and mixed infection was recorded in 6.25% cases. Paramphistomum spp. was the most commonly observed GIP in 42.18% (26/64) animals while Strongyloides was least reported species in 10.90% (7/64) animals. The highest Egg per gram (EPG) count was observed in Black buck during pre-monsoon season (EPG= 800) and lowest EPG (100) count was recorded in Hog deer and blue bull during pre-monsoon season.

Introduction

Parasitic diseases play an important role in healthcare and management of wild animals in captivity. The health status of captive animal depends on many factors like feeding, keeping conditions, animal management and environmental conditions such as temperature, rainfall and humidity (Goossens *et al.*, 2005). Various species of captive wild animals have

been found to be infested by different types of endoparasites leading to variable degree of morbidity and mortality (Singh *et al.,* 2009).

In captivity, wild animals may succumb to parasitic infection due to environmental stress such as change in living conditions and space limitations (Atanaskova *et al.,* 2011). Despite of various studies carried out on parasitic diseases in wildlife (Islam, 2006), there is still scarcity in terms of documented reports of prevalence of gastrointestinal parasites in captive wild herbivores of Chhattisgarh.

Materials and Methods

Study area

The present study was carried out to study the prevalence of parasitic infection in wild herbivore animals kept at Kanan Pendari Zoo, Bilaspur, Chhattisgarh.

Kanan Pendari Zoo, Bilaspur is located between 22° 05′ N, 82° 13′ E at Bilaspur city and is spread across an area of 114 hectares. The study programme was carried out over a period of 05 months from March, 2018 to July, 2018 in two different seasons *viz*. summer (March to May) and pre-monsoon (June to July).

Collection of faecal samples

Freshly passed faecal samples were collected from the animal enclosure in clean, dry interlocked polythene bags as described by Chandrakar *et al.,* (2020). The samples were labeled indicating animal information *viz*. species, age, sex and enclosure number respectively for easy identification of the samples for laboratory analysis

Sedimentation method

About one gram of faeces was taken in pestle and mortar followed by addition of little amount of distilled water and mixed properly. The suspension was strained to remove any debris followed by centrifugation for 2 to 3 minutes @ 1500 rpm.

The supernatant was discarded and a drop of sediment was placed on clean grease free glass slide and was covered with a clean cover slip avoiding any air bubble. The slide was examined under low power objective (10X) of microscope (Soulsby, 1982).

Floatation method

About one gram of faeces was taken in pestle and mortar and adequate amount of saturated solution of magnesium sulphate was added and mixed thoroughly.

The suspension was strained to remove any debris and centrifuged @ 1500 rpm for 2 to 3 minutes. The surface layer was examined under low power objective (10X) of microscope for the presence of parasitic eggs (Soulsby, 1982).

Mc master method for EPG

The method suggested by Skerman and Hillard (1966) was used for estimation of EPG of faeces. About 2 gm of faecal sample was added to 20 ml of water in a beaker. It was left for 30 minutes for soaking.

Afterwards, the whole sample was taken into the pestle and mortar and was mixed thoroughly. The sample was again poured back into the same beaker and about 40 ml of saturated salt solution was added. Then mixing was done thoroughly without forming air bubbles (Dilution factor is 1 in 30).

One ruled chamber of the Modified McMaster Slide was charged and all eggs were counted under low power (10X) of the microscope. The value of EPG was determined by formula as number of eggs counted x 100.

Results and Discussion

Overall prevalence

The overall prevalence of gastro-intestinal parasites in captive herbivores at Kanan Pendari Zoo, Bilaspur was 28.31% (64/226) which is presented in table no. 1 and fig. 1.

The findings of our study are in concordance with prevalence rate of gastro-intestinal parasites (33.33%) in Assam State Zoo, Guwahati (Borodoloi *et al.,* 1991). Similarly, prevalence rate of 35.60% has been reported in Rangpur Recreational Garden and Zoo, Bangladesh (Khatun *et al.,* 2014).

However, the prevalence recorded in our study was comparatively lower than the findings of Thawait *et al.,* (2014) who have reported prevalence of 46.20% in animals of Nandan Van Zoo, Raipur, Chhattisgarh. Varadharajan *et al.,* (2001) have also reported a higher prevalence rate of gastro-intestinal parasites (68.05%) in captive wild animals of Thrissur Zoo Kerala. Similarly, a much higher prevalence rate of 68.0% has been reported by Mir *et al.,* (2016) in their work carried out in Bir Moti Bagh Mini Zoo (Deer Park), Patiala, Punjab.

Seasonal prevalence

The season wise prevalence of gastro-intestinal parasites in captive wild herbivores has been represented in table no.2 and fig. 2.

Out of 226 fecal samples examined during the study period, 100 samples were collected in summer (March-May) season while 126 samples were collected in pre-monsoon (June-July) season. The findings of faecal sample examination revealed that 26 samples were found to be infected with gastro-intestinal parasites in summer season while 38 samples were found to be infected in pre-monsoon season, thereby indicating prevalence of 26.00% (26/100) in summer and 30.15% (38/126) pre-monsoon season respectively.

The findings of our study are in concordance with prevalence rate of gastro-intestinal parasites in summer (26.00%) and rainy season (30.15%) in Van Vihar National Park, Bhopal (Singh *et al.,* 2009).

Similarly, prevalence rate of 27.5% in summer and 40.5% in rainy season has been reported in animals of Balodyan and Maharajabag Zoo, Nagpur (Jadhav *et al.,* 2010).

However, the season wise prevalence was observed to be comparatively lower than the findings of Sahoo *et al.,* (2009) who have reported prevalence of 47.62% in captive wild animals of Nandankanan Zoological Park, Bhubaneswar, Orissa. Barmon *et al.,* (2014) have also reported a higher prevalence rate of gastro-intestinal parasites in summer (70.59%) and winter (66.67%) in wild animals of Char Kukri Mukri Upzilla of Bhola district of Bangladesh.

Species wise prevalence

The prevalence of gastro-intestinal parasites in different species of captive wild herbivores has been represented in table no. 3 and fig. 3.

Among different herbivores, Blue bull showed highest prevalence (75.00%) of GI parasites followed by hog deer (50.00%), barasingha (43.75%), barking deer (33.33%), spotted deer (28.00%), black buck (26.31%), sambar (20.00%) and chausingha (10.34%) respectively.

The findings of our study are in concordance with prevalence rate of gastro-intestinal parasites of Spotted deer (28.57%) in Pench National Park, Maharashtra (Nighot *et al.,* 2004).

Table.1 Overall prevalence (%) of GIP in captive wild herbivores in KPZ, Bilaspur

Total no. of faecal samples examined	No. of positive faecal samples	Prevalence (%)
226	64	28.31

Table.2 Season wise prevalence (%) of GIP in captive wild herbivores in KPZ, Bilaspur

Season	No. of faecal samples examined	No. of positive faecal samples	Prevalence (%)
Summer	100	26	26.00
Pre-monsoon	126	38	30.15

Table.3 Species wise prevalence (%) of GIP in captive wild herbivores in KPZ, Bilaspur

Species	No. of faecal samples examined	No. of positive faecal samples	Prevalence (%)
Blue bull (*Boselaphus tragocamelus*)	16	12	75.00
Hog deer *(Axis porcinus)*	4	2	50.00
Barasingha (*Rucervus duvaucelii)*	16	7	43.75
Barking deer (*Muntiacus muntjak*)	6	2	33.33
Spotted deer (*Axis axis*)	92	26	28.26
Black buck (*Antilope cervicapra*)	38	10	26.31
Sambar (*Cervus unicolor*)	10	2	20.00
Chousingha (*Tetracerus quadricornis*)	29	3	10.34

Table.4 Over all prevalence of different GIP

Type of infection	No. of Positive samples	Prevalence (%)
Nematode (single)	33	51.56
Trematode (single)	27	42.18
Mixed infection	4	6.25

Table.5 Species wise prevalence (%) of different GIP

Species of parasite	Total no. of positive samples (n=64)	
	No. of positive samples	Prevalence (%)
Paramphistomum spp.	27	42.18
Strongyle spp.	26	40.60
Strongyloides spp.	7	10.90
Strongyle spp. and Strongyloides spp.	2	3.12
***Strongyle spp. and Oesophgostomum* spp.**	2	3.12

Fig.1 Overall prevalence (%) of GIP in captive wild herbivores in KPZ, Bilaspur

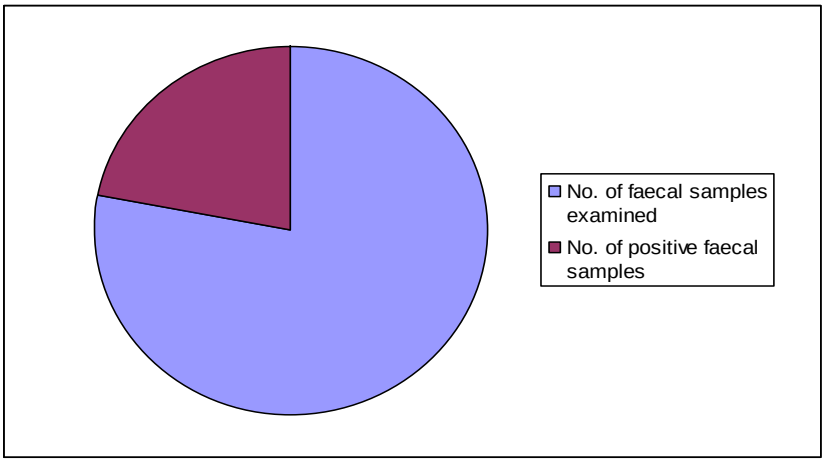


Fig.2 Season wise prevalence (%) of GIP in captive wild herbivores in KPZ, Bilaspur

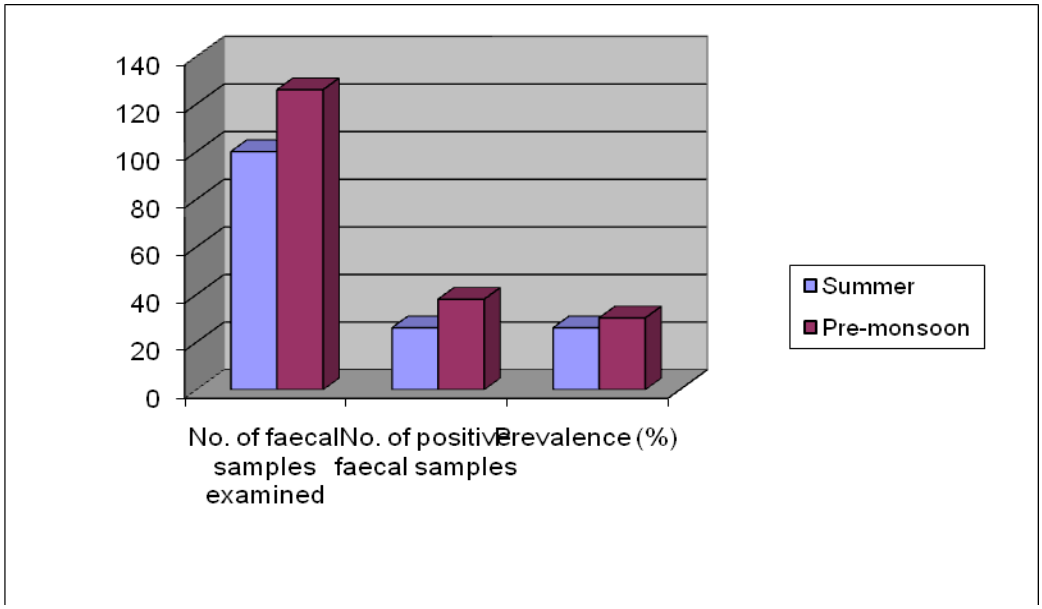


Fig.3 Species wise prevalence (%) of GIP in captive wild herbivores in KPZ, Bilaspur

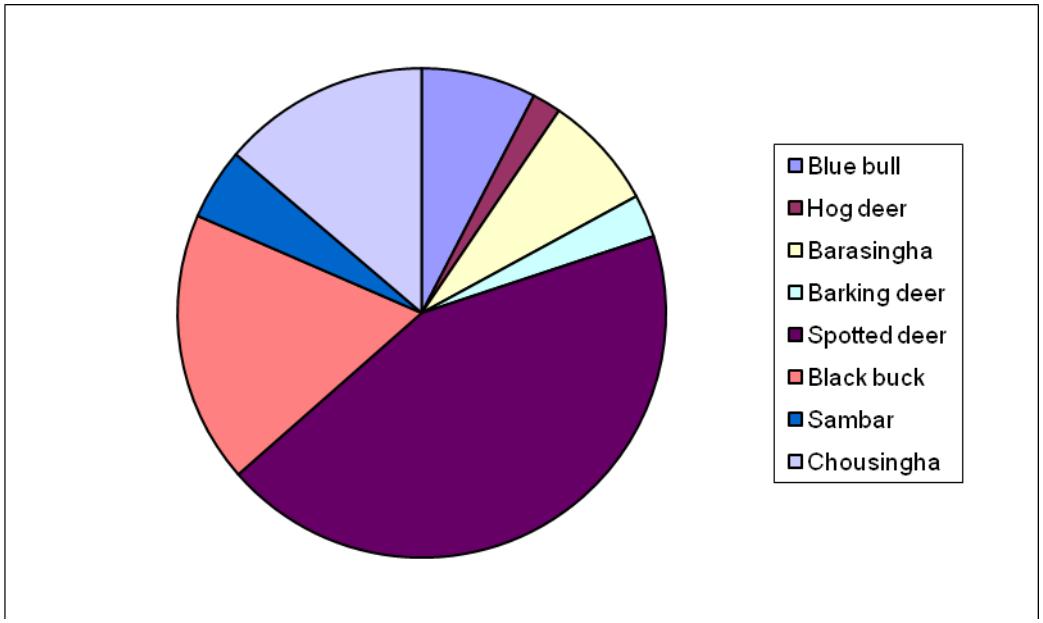


Fig.4 Over all prevalence of different GIP

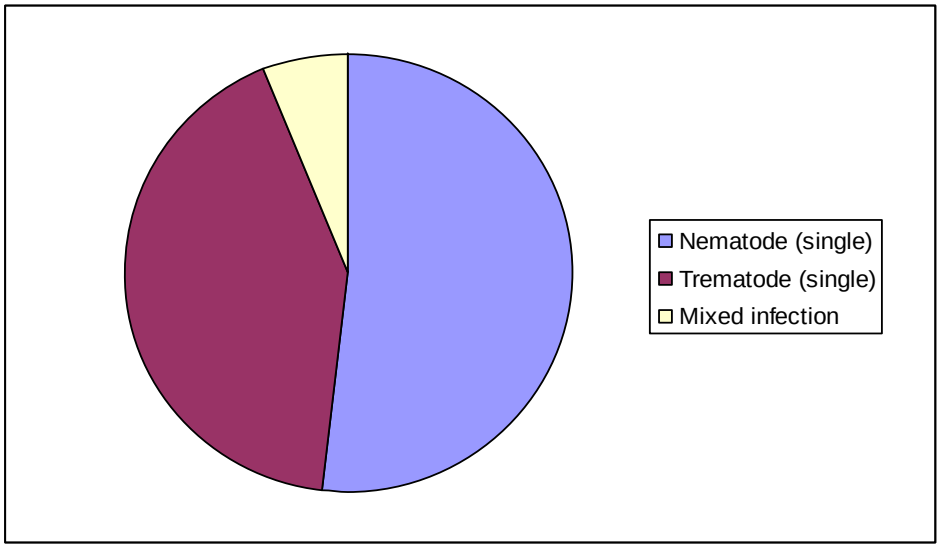
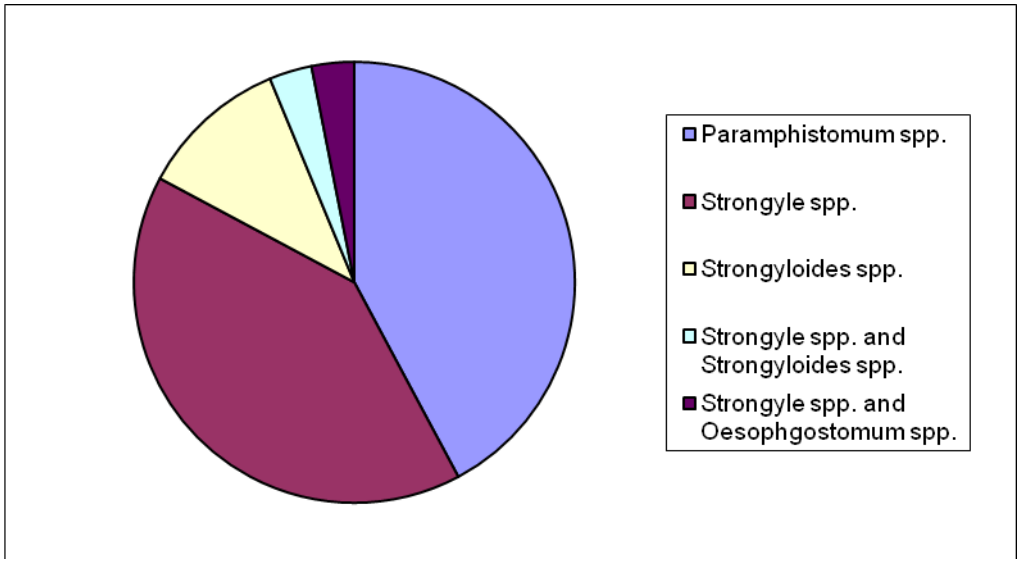


Fig.5 Species wise prevalence (%) of different GIP



However, the species wise prevalence was observed to be comparatively lower than the findings of Mir *et al.,* (2016) who have reported prevalence rate in barking deer (100%), black buck (75.00%), sambar (66.00%), spotted deer (50.00%) of Bir Moti Bagh Mini Zoo (Deer Park), Patiala, Punjab.

Over all prevalence of different gastro-intestinal parasites

The overall prevalence of different gastro-intestinal parasites in captive wild herbivores has been represented in table no. 4 and fig. 4.

The overall prevalence of nematode parasites was 51.56% (33/64) while trematode parasites were reported in 42.18% (27/64) wild herbivores during the study. However, mixed infection was detected in 04 samples indicating an overall prevalence of mixed infection to be 6.25% (04/64). The finding revealed that single nematode infection was significantly ($p \leq 0.05$) higher than trematode and mixed infection in captive wild herbivores in our study. The prevalence of nematode infection in Kanan Pendari Zoo (51.56%) is similar to the findings of Bante *et al.,* (2013) who have reported 42.36% prevalence of nematodes in Kamala Nehru Prani Sangrahalaya, Indore.

Species wise prevalence of different gastro-intestinal parasites

The species wise prevalence of different gastro-intestinal parasites in captive wild herbivores in zoo has been represented in table no. 5 and fig. 5.

Out of 64 positive samples from Kanan Pendari Zoo, Bilaspur, single infection with *Paramphistomum* spp. was recorded in 42.18% (27/64) animals while *Strongyle* spp. was recorded in 40.60% (26/64) animals and *Strongyloides* spp. in 10.90% (7/64) animals respectively. Mixed parasitic infection of *Strongyle* spp. along with *Oesophagostomum* spp. was recorded in 3.12% (2/64) and *Strongyle* spp. with *Strongyloides* spp. was recorded in 3.12% (2/64) animals respectively.

Mandal *et al.,* (2002) have reported infection of *Strongyle* spp. (41.7%) followed by *Paramphistomum* spp. (15.6%), *Strongyloides* spp. (11.5%) respectively in wild animals of

Mudumalai Wildlife Sanctuary, Tamilnadu. Singh *et al.,* (2009) have reported highest prevalence for *Strongyles* (26.15%) followed by *Strongyloides* spp. (7.13%) and *Paramphistomes* (1.98%) in captive wild animals of Van Vihar National Park, Bhopal. Rahman *et al.,* (2014) have reported prevalence rate of *Paramphistomum* spp. (36.5%), *Strongyloides* spp. (1.9%) and *Paramphistomum* spp. (33.33%) in captive wild animals of Dhaka National Zoological Garden, Bangladesh.

In contrast to our findings, *Strongyle* spp. was the most commonly observed GIP (62.50%) while *Paramphistomum* was least reported species in 5.00% in captive wild herbivores of Nandanvan Zoo, Raipur (Khutey *et al.*, 2020)

Egg per gram count in different species

The EPG count in Kanan Pendari Zoo, Bilaspur ranged from 100-800 among 02 different seasons. The highest EPG count was observed in Black buck during pre-monsoon season (EPG= 800). However, lowest EPG (100) count was recorded in Hog deer and Blue bull during pre-monsoon season.

Singh *et al.,* (2009) have reported that overall mean EPG was maximum for *Strongyles* (585.19), followed by *Amphistome* (250) and *Strongyloides* (127.78) reported in captive wild animals of Van Vihar National Park, Bhopal.

Rahman *et al.,* (2014) have reported an intensity of infection in terms of EPG ranging from 100-500 in Spotted deer of Dhaka National Zoological Garden, Bangladesh.

In another study, conducted in captive wild herbivores of Nandanvan Zoo, Raipur, highest EPG count was reported in Chausingha and blue bull during pre-monsoon season (EPG= 700) while lowest EPG (100) count was reported in Spotted deer during summer season (Khutey *et al.,* 2020).

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