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Studies on prevalence of gastro-intestinal parasites in captive wild herbivores in Nandanvan zoo, Raipur

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Abstract

The present study was undertaken to study the prevalence of gastro-intestinal parasites (GIP) in captive wild herbivores in Nandanvan Zoo, Raipur with respect to species, age, sex and season to assess the intensity of gastro-intestinal parasites in captive wild herbivores. A total of 145 faecal samples were collected from enclosures of various captive wild herbivores which 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 27.50%. Seasonal prevalence was reported to be 16.00% in summer season and 35.70% in pre-monsoon season respectively. Amongst all species studied, Blue bull showed highest prevalence (61.90%) of GI parasites. The gastro-intestinal parasitic infection was recorded to be higher in male (55.55%) than in female animals (50.00%). During the study, prevalence of trematodes was 37.10%, nematodes was 62.50% and mixed infection was recorded in 32.50% cases. *Strongyle* spp. was the most commonly observed GIP in 62.50% (25/40) animals while *Paramphistomum* was least reported species in 5.00% (2/40) animals. The highest EPG count was observed in Chausingha and blue bull during pre-monsoon season (EPG= 700) and lowest EPG (100) count was recorded in Spotted deer during summer season.

Keywords: Captive herbivores, gastrointestinal parasites, prevalence

Introduction

Parasitic diseases represent a major concern in captive wild animals which are maintained in confined areas as there are chances of high environmental contamination resulting in loss of health condition. The health status of any wild animal in captivity depends upon many factors like feeding, managerial conditions and environmental conditions such as temperature, rainfall and humidity (Goossens *et al.*, 2005) [3]. Wild animals have been found to be infested by different type of endoparasites leading to high morbidity and mortality (Singh *et al.*, 2009) [10]. There are reports of wild animals succumbing to parasitic infection in captivity due to environmental stress such as change in living conditions and space limitations (Atanaskova *et al.*, 2011) [1].

Materials and Methods**Location of study**

Nandanvan Zoo, Raipur is located between 21° 15' N, 81° 41' E in Chhattisgarh. The zoo is located at a distance of 16 km from Raipur city and has total land area of 10 hectares. This zoo was primarily established to serve as shelter to sick, injured and rescued wild animals. The present study was carried out to study the prevalence of parasitic infections in wild herbivore animals kept at Nandanvan Zoo, Raipur of Chhattisgarh. The study plan was carried out over a period of 05 months from March, 2018 to July, 2018 in different seasons *viz.* summer (March to May) and pre-monsoon (June to July).

Sample collection

Freshly passed faecal samples were collected from the zoo animal enclosure in a clean, dry interlocked polythene bags. 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 covered with a clean cover slip avoiding any air bubble. The slide was examined under low power objective (10X) of microscope (Soulsby, 1982)^[12].

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 ova (Soulsby, 1982)^[12].

Mc master method for EPG

About two gram of faecal sample was soaked in 20 ml water in a beaker for 30 minutes. Then the whole sample was mixed thoroughly in a pestle and mortar. The sample was transferred to 100ml beaker and 40 ml saturated salt solution was added and mixed thoroughly without forming bubbles (dilution factor is 1 in 30). Then the sample was charged in one ruled chamber of the McMaster slide and eggs were counted in the egg chamber examined under low power (10X) of the microscope (Skerman and Hillard, 1966)^[11].

Area of each chamber = 16mm (Length) x 12.5mm (Breadth) x 1.5mm (Height) = 300mm = 0.3cc = 0.3 ml

Eggs of each chamber = $\frac{\text{Number of eggs counted}}{\text{Area of one chamber}} \times \text{Dilution factor}$

$$= \frac{\text{Number of eggs counted}}{0.3} \times 30$$

$$= \text{Number of eggs counted} \times 100$$

Results and Discussion**Overall prevalence of GIP**

The overall prevalence of gastro-intestinal parasites in captive wild herbivores at Nandanvan Zoo, Raipur was estimated on the basis of faecal sample examination. Out of 145 faecal samples examined, 40 samples were found to be positive for parasitic infection indicating an overall prevalence of 27.50%. 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)^[2]. Similarly, prevalence rate of 35.6% has been reported in Rangpur Recreational Garden and Zoo, Bangladesh (Khatun *et al.*, 2014)^[4].

However, the prevalence was comparatively lower than the findings of Thawait *et al.* (2014)^[13] who have reported prevalence of 46.20% in animals of Nandanvan Zoo, Raipur, Chhattisgarh. Varadharajan *et al.* (2001)^[14] 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)^[6] in their work carried out in Bir Moti Bagh Mini Zoo (Deer Park), Patiala, Punjab.

Species-wise prevalence of GIP

Among different herbivores, Blue bull showed highest prevalence (61.90%) of gastro-intestinal parasites followed by hog deer (50%), barasingha (43.75%), black buck (29.98%), spotted deer (27.86%), sambar (26.78%), chausingha (19.23%), barking deer (15.78%), Indian gazelle (0%), thamin deer (0%) and mouse deer (0%) 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)^[7].

However, the species wise prevalence was observed to be comparatively lower than the findings of Mir *et al.* (2016)^[6] 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.

Age-wise prevalence of GIP

The age wise prevalence of gastrointestinal parasitism was recorded to be 26.38% in adult and 43.47% in young animals in our study. The findings of our study regarding age wise prevalence of gastrointestinal parasites in captive wild herbivores in adult animals (26.38%) is much lower than prevalence rate of 70.50% reported in adult captive wild animals of Thrissur Zoo, Kerala (Varadharajan *et al.*, 2001)^[14]. Similarly in our study 43.47% prevalence was reported in young animals which is also lower than prevalence of 54.00% in young animals of Thrissur Zoo, Kerala (Varadharajan *et al.*, 2001)^[14].

Sex-wise prevalence of GIP

The male and female captive wild herbivores (Nilgai) are kept in separate enclosure in Nandanvan Zoo, Raipur. Out of total of 26 samples of Nandanvan Zoo, Raipur, 18 faecal samples from male blue bull and 8 faecal samples from female blue cow were examined to study the effect of sex on the prevalence of gastro-intestinal parasites. Fecal examination revealed prevalence of 55.55% (10/18) in male and 50.00% (4/8) in female Nilgai respectively. The sex wise prevalence of gastrointestinal parasites was recorded to be 55.55% in male and 50.00% in female Nilgai in our study. The present study revealed that sex has no significant ($p > 0.05$) effect on prevalence of gastro-intestinal parasites in captive wild herbivores.

However, the sex wise prevalence infection (50.00%) was observed to be comparatively higher than the findings of Opara *et al.*, (2010)^[8] who have reported prevalence of 37.2% in female of Zoological Garden, Nekede Owerri, Southeast Nigeria.

Seasonal prevalence of GIP

Out of 145 fecal samples examined during the study period, 75 samples were collected in summer (March-May) season while 70 samples were collected in pre-monsoon (June-July) season. The findings of fecal sample examination revealed that 15 samples were found to be infected with gastro-intestinal parasites in summer season while 25 samples were found to be infected in pre-monsoon season, thereby indicating prevalence of 16.00% (15/75) in summer and 35.70% (25/70) pre-monsoon season respectively.

Over all prevalence of different GIP

The overall prevalence of nematode parasites was 62.50%

(25/40) while trematode parasites were reported in 5.00% (02/40) wild herbivores during the study. However, mixed infection was detected in 13 samples indicating an overall prevalence of mixed infection to be 32.50% (13/40). The findings revealed that single nematode infection was significantly ($p \leq 0.05$) higher than trematode and mixed infection in captive wild herbivores in our study.

There are no specific findings related to trematode infection in captive wild herbivores. However, mixed infection rate of 42.3% has been reported in captive wild animals of Dhaka National Zoological Garden, Bangladesh by Rahman *et al.* (2014)^[9].

Species wise prevalence of different GIP

Four types of eggs were recovered from the faecal samples during this study which included *Paramphistomum* spp., *Strongyle* spp., *Oesophagostomum* spp. and *Strongyloides* spp. A total of 40 faecal samples were found to be positive for gastrointestinal parasites from Nandanvan Zoo, Raipur. Infection of *Paramphistomum* spp. was recorded in 5.00% (2/40) animals while *Strongyle* spp. was recorded in 62.50% (25/40) animals respectively. Mixed infection of *Paramphistomum* spp. along with *Strongyle* spp. was observed in 10.00% (4/40) animals, *Strongyle* spp. along with *Oesophagostomum* spp. in 20.00% (8/40) animals and *Paramphistomum* spp. with *Oesophagostomum* spp. was reported in 2.50% (1/40) 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, Tamil Nadu.

Singh *et al.* (2009)^[10] have reported highest prevalence for *Strongyles* spp. (26.15%) followed by *Strongyloides* spp. (7.13%) and *Paramphistomes* spp. (1.98%) in captive wild animals of Van Vihar National Park, Bhopal.

Season-wise EPG count

The EPG count ranged from 100 to 700 during 02 different seasons. The highest EPG count was recorded in Chousingha and Blue bull during pre-monsoon season (EPG=700). However, lowest EPG count was recorded in Spotted deer (EPG=100) during summer season.

Singh *et al.* (2009)^[10] have reported that overall mean EPG was maximum for *Strongyles* spp. (585.19) followed by *Amphistome* spp. (250) and *Strongyloides* spp. (127.78) reported in captive wild animals of Van Vihar National Park, Bhopal. Rahman *et al.* (2014)^[9] have reported in intensity of infection in terms of EPG/CPG ranging from 100-500 in spotted deer of Dhaka National Zoological Garden, Bangladesh.

Conclusion

In conclusion, it can be said that the prevalence of gastrointestinal parasites in Nandanvan Zoo, Raipur was reported to be 27.50% during this study which indicates that zoo is not free from parasitic infection. A higher rate of prevalence of gastro-intestinal parasites was observed in pre-monsoon season in our study. The season wise prevalence of gastrointestinal parasitism was recorded to be 16.00% summer and 35.70% pre monsoon. A higher rate of prevalence of gastro-intestinal parasites was observed in male animals in our study. A higher rate of prevalence of gastro-intestinal parasites was observed in young animals in our study. The age wise prevalence of gastrointestinal parasitism

was recorded to be 26.38% in adult and 43.47% in young animals in our study. Highest prevalence (61.90%) of gastro-intestinal parasites was observed in Blue bull population with *Strongyle* spp. as most predominant parasite. An overall prevalence of different gastrointestinal parasites was recorded to be 50.31% nematode and 37.10% trematodes in our study.

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