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GASTROINTESTINAL PARASITIC PREVALENCE AND INTENSITY: A PRELIMINARY SURVEY ON SYMPATRIC UNGULATES IN TATAKUTI WILDLIFE SANCTUARY, JAMMU

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The protected areas of Pir Panjal range remain under heavy livestock grazing pressure from May to October which results in sharing of a habitat with their wild counterparts in the natural habitats. This increases competition for different resources, besides posing a threat of various infectious diseases like those caused by gastrointestinal helminths. The present study was aimed to evaluate the gastrointestinal parasitic load of domestic livestock (sheep and goat) and goral (*Naemorhedus goral*) grazing in the Tatakuti wildlife sanctuary. Among 222 samples of goat, sheep and goral, 160 (72.07%) were positive for one or more species of parasites. Out of 90 samples of sheep, 75 samples of goat, and 57 samples of goral examined during this study, 74 (82.22%) of sheep, 55 (73.33%) of goat and 31(54.38%) samples of goral were infected by one or more species of Helminth parasites with an overall prevalence of 72.07%. Most of the samples were found infected with the mixed infection of parasites. The most prevalent parasite recorded in the study was *Haemonchus* spp. (59.45%) followed by *Nematodirus* spp. (56.75%), *Trichuris* spp. (54.50%), *Strongyloides* spp. (52.70%), *Trichostrongylus* spp. (49.45%), *Moniezia* spp. (44.14%) and *Fasciola* spp. (42.79%).

Keywords: Parasitic infestation; Tatakuti Wildlife Sanctuary; prevalence; goral.

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1. INTRODUCTION

The protected areas of Jammu and Kashmir remain under livestock grazing from May to October which results in sharing of habitat between domestic and wild animals. This increases competition for food and water resources besides increasing the threat of infectious diseases among different hosts [1,2]. The rearing of livestock is an important source of livelihood for small landholders and landless laborers since ancient times (Pathak and Pal., 2008). To take the advantage of seasonal forage availability in and around the protected areas of the Pir Panjal range, grazing by thousands of livestock of migratory herders has been reported [2].

The animals are infected by various infectious agents and it is quite easy to diagnose viral and bacterial diseases by their clinical signs, but it is difficult to assess parasitic infection especially in early stages without clinical symptoms [3]. The parasite is a general term used for describing those organisms which obtain their nourishment from other organism called as host. The parasite may be ectoparasite which lives on the body of the host or endoparasite which lives inside the body of the host [3]. Among parasites the term helminth is usually employed for those organisms which are elongated with flat or rounded bodies and can live anywhere in the body of the host [4]. The most favorable sites for these parasites are duodenum, ileum, cecum and large intestine (Cuomo *et al.* 2000). Most of these parasites use faeco-oral route for infecting other hosts [3].

GIT helminth infestation is known to decrease the growth rate of domestic ruminants by about 25% besides decreasing fertility rate and milk yields by 30%, and results in an increase in mortality of infected hosts [5]. These helminths reduce body mass, reduce fecundity and increase mortality in case of free- ranging wild ungulates [6]. The productivity of ruminants is constrained by parasitic infections [7]. Helminths have a consequent effect on immune function and response to the secondary infection [8]. The helminths include nematodes, cestodes and trematodes which affect the hosts with varying intensity and prevalence [9].

Nematidosis is a major threat to the productivity and wellbeing of the hosts as it endangers animal welfare worldwide [10]. In tropical and sub-tropical areas prevalence of gastrointestinal nematodes has adversely impacted the livestock industry by affecting production, growth rate and fecundity of hosts [11]. Haemonchosis caused by *Haemonchus* spp. causes anemia and parasitic gastroenteritis in different hosts [12]. *Trichostrongyle* infection (*Trichostrongylosis*) causes anemia, weight loss, poor wool, poor milk production and bottle jaw [13]. The helminth infections in general produce anorexia, reduced feed intake, loss of blood and plasma proteins, alterations in protein metabolism, enteritis, diarrhea, low wool production and death due to secondary infections [14].

The parasitic infection influences hosts physiology which significantly affects the reproductive potential of hosts by decreasing fecundity [15]. Increased metabolic rate of infected animals decreases available energy for reproduction by draining nutrients, and makes animals more susceptible to other pathogenic agents [16]. The bovids harbor different helminth parasites like *Paramphistomum* spp., *Fasciola* spp., *Dicrocoelium* spp., *Haemonchus* spp., *Trichuris* spp., *Chabertia* spp., *Dictyocaulus* spp., *Moniezia* spp., *Stilesia* spp., *Strongyloides* spp., and *Trichostrongyloides* spp. [14,10,2].

2. MATERIALS AND METHODS

2.1 Study Area

Tatakuti wildlife sanctuary ($33^0 39^{'}$ N and $74^0 32^{'}$ E) located in Poonch district of Jammu along the southern asppect of Pir Panjal range has an area of 67.27 km^2. It is adjacent to Hirpora wildlife sanctuary on the eastern side and is connected to the Chatapani area just across the Pir Panjal pass .The major vegetation types include coniferous forests dominated by Birch (*Betula utilis*) and juniper (*Juniperus communis*), the major shrub in the sub-alpine area. In the lower elevation and along the riverine valley, Maple (*Acer caesium*), Walnut (*Juglans* spp.) and Vibernum (*Vibernum continifolium*) shrubs are dominant [1]. Large number of domestic animals are grazing in this wildlife sanctuary from late May with higher densities from June to October. Besides these domestic animals, the sanctuary harbours various wild mammals which include Markhor, Goral, Musk deer, Leopard, Black bear and jackal [1,2].

2.2 Methodology

During the period of investigation systematic surveys were carried in Tatakuti wildlife sanctuary for collection of faecal samples. Fresh faecal pellets of goral, sheep and goat were randomly collected on quarterly basis. The samples of sheep and goats were collected only during the summer months (June to October) while as that of goral were collected in late autumn and winter months(November to may) in order to avoid confusion among the samples of domestic and wild ungulates. In order to avoid contamination of faecal samples only that portion of faecal samples was collected which is not in direct contact with the soil. Faecal pellets were placed in collection vials and zip lock bags which were carefully labeled with animal identification, species,

date, and place of collection along with GPS coordinates. Since the samples were collected from far flung area 4% formalin was admixed to the samples in order to avoid hatching of eggs/oocysts. Preserved samples were transported to the Parasitology Research Laboratory, Department of Zoology, University of Kashmir where faecal samples were microscopically examined for helminth eggs and oocysts using concentration methods by Zinc sulphate flotation, fecal sedimentation and Modified McMaster techniques (Soulsby, 1982). Morphological characters like shape, size and color were used for identification of different parasitic eggs and oocysts (Soulsby, 1982).

2.3 Data Analysis

Percentages with their respective means ± SEM (standard devation) and 95% confidence intervals were employed to calculate the prevalence of helminth parasites. Eggs were estimated as number of eggs per gram of faeces with their respective median and percentile. The data was analyzed using Statistical packages MINITAB software version 13.2 (Minitab 2002) and SPSS-17 for windows. In all the analysis, confidence level was held at 95% and $P<0.05$ for significance.

3. RESULTS

Out of 222 samples of goat, sheep and goral, 160 (72.07%) were positive for one or more species of parasites. Out 90 samples of sheep, 75 samples of goat, and 57 samples of goral examined during this study, 74 (82.22%) of sheep, 55 (73.33%) of goat and 31(54.38%) samples of goral were infected by one or more species of Helminth parasites with an overall prevalence of 72.07%. Most of the samples were found infected with the mixed infection of parasites. From the results it is clear that the prevalence in sheep is more in comparison to goat and goral (Table 1). After carrying out the faecal examination for the presence and prevalence of gastro-intestinal helminths, three groups of helminth parasites *viz*., nematodes, trematodes and cestodes with different levels of infestation were encountered during present study. The most prevalent parasite recorded in the study was *Haemonchus* spp. (59.45%) followed by *Nematodirus* spp. (56.75%), *Trichuris* spp. (54.50%), *Strongyloides* spp. (52.70%), *Trichostrongylus* spp. (49.45%), *Moniezia* spp. (44.14%) and *Fasciola* spp. (42.79%). Both the domestic hosts (sheep and goat) showed the remarkable monthly variation in prevalence. The overall prevalence was highest in July (88.84%) followed by June (88.57%), August (77.41%), September (71.87%) and October (67.64%).The monthly prevalence in sheep was higher as compared to goat (Table 2). The monthly prevalence of parasitic infection in Goral shows a considerable variation in different months. The highest prevalence (71.42%) was recorded in May while as the least prevalence (42.85%) was recorded in January (Table 3).

Table 1. Parasite wise prevalence in different hosts of Tatakuti wildlife sanctuary

S. No	Parasites	Class	Goral positive sample (prevalence)	Sheep positive samples (prevalence)	Goat positive samples (prevalence)	Overall prevalence
1	*Haemonchus* spp.	Nematodes	19(33.33%)	67(74.44%)	46(61%)	59.45%
2	*Nematodirus* spp.		17(29.82%)	65(72.22%)	44(58.66%)	56.75%
3	*Trichuris* spp.		17(29.82%)	61(67.77%)	43(57.33%)	54.50%
4	*Strongyloides* spp.		16(28.07%)	57(63.33%)	44(58.66%)	52.70%
5	*Trichostrongylus* spp.		15(26.31%)	54(60%)	41(54.66%)	49.54%
6	*Moniezia* spp.	Cestode	10(17.54%)	51(56.66%)	37(49.33%)	44.14%
7	*Fasciola* spp.	Trematode	11(19.29%)	49(54.44%)	35(46.66%)	42.79%

Table 2. Monthly variation of parasitic prevalence in sheep and goat from June to October in TWS

Host	Sheep		Goat		Over all prevalence
Month	Total samples examined	Positive samples (prevalence)	Total samples examined	Positive samples (prevalence)	
June	18	16(88.88%)	15	12(80%)	84.84%
July	20	18(90%)	15	13(86.66)	88.57%
August	17	14(82.35%)	14	10(71.42 %)	77.41%
September	17	13(76.47%)	15	10(66.66%)	71.87%
October	18	13(72.22%)	16	10(62.50%)	67.64%

Table 3. Monthly variation of parasitic prevalence in Goral from november to may in Tatakuti wildlife Sanctuary

Host		Goral
Month	**Total samples examined**	**Positive samples (prevalence)**
November	7	4(57%)
December	8	4(50%)
January	7	3(42.85%)
February	9	5(55.55%)
March	8	5(62.25%)
April	8	5(62.25%)
May	7	5(71.42%)

4. DISCUSSION AND CONCLUSION

Gastrointestinal helminth parasitism is one of the major problem responsible for deficit of production in livestock of Himalayan and other hilly areas of the India [17]. During this study both wild and domestic animals were found to be infected with the same gastrointestinal helminth species with varying level of infestation and prevalence. Helminths occur in the wild as well as in domestic animals (Gupta, 1997).

In the present study, seven species of helminths belonging to nematodes, cestodes and trematodes were recorded from all the three hosts. The prevalence of all the helminths recorded in the study showed a considerable variation. The recorded parasites were *Haemochus* spp., *Nematodirus* spp., *Trichuris* spp., *Strongyloides* spp., *Trichostrongyloides* spp., *Moniezia* spp. and *Fasciola* spp. The prevalence of parasites reported in the study is more in domestic animals (78.18%) as compared to their wild counter parts. This is because of the fact that in traditional practice of live-stock grazing, domestic animals which include sheep, goat and cattle are grazing together and are usually sympatric, which increases the chances of inter and intra-specific contact rates responsible for increased rate of cross-transmission of infective stages of helminths among the hosts [18]. The results of our study are in close agreement with the studies of Pandit et al. [19] who reported an overall prevalence of 65.4% and the results of Yadav et al. [20] with an overall prevalence of 83.24%, Khajuria et al. [21] with an overall prevalence of 64.54% in sheep of Jammu valley. The results of the present study are in close approximation to the findings of Tariq et al. 2008 who reported an overall prevalence of 61.6% in the sheep of Kashmir valley. The results of our study have shown that the parasitic prevalence is more in sheep in comparison to the goat. These results overlap with the studies of Tariq et al., 2008 who have also reported the high prevalence in sheep as compared to goats.

Among the nematodes the most prevalent parasite observed in the entire study was *Haemonchus* spp. which is similar to the results of Rajapakse et al. [22]. According to Radostits et al. [23], the predisposing causes for haemonchosis include overcrowding of hosts, lush pasture, humid climatic conditions and poor animal care.

The prevalence of parasites in goral of TWLS is 54.38% which is in concordance with the studies of several workers who have reported almost similar prevalence in wild ungulates of different regions of the world [24]. Most of the samples were found to be infected with the mixed infection of parasites which is in close agreement with the studies of Shibashi et al. [25]. The parasites reported in the wild ungulates of the study have already been reported by different workers in the captive wild animals from Nigeria, Italy, and Malaysia [26-29]. The overall parasitic prevalence reported in the wild ungulate of our study is less in comparison to the studies of other workers [29]. This is because of the fact that the number of this wild ungulate in Tatakuti wildlife sanctuary is less which results in low group size and less congregation as compared to domestic ungulates [2]. The less congregation has a strong influence on the intensity and prevalence of infection between the individuals of same species [30] (Altizer et al., 2003).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ahmad R, Dar SA, Suhail I, Zargar R, Charoo SA, Sofi MN, Mir FA, et al. Recovering Markhor in Jammu and Kashmir, status, distribution, and habitat use. Wildlife Trust of India, Noida; 2014.
2. Bhat RA, Tak H, Bhat BA, Fazli MF, Wani HM, Haq IU, et al. Livestock helminth infestation as a potential threat to wild

ungulates in Hirpora Wildlife sanctuary. Journal of Himalayan Ecology and Sustainable Development. 2019;14:71-78.
3. Kilpatrick AM, Altizer S. Disease Ecology. Nature Education Knowledge. 2010;1(13):408.
4. Castro GA. Helminth: Structure classification growth and development: Barone S, editor. Medical Microbiology.4th ed. Chapter 86.; 1996.
PMID: 2143320.
5. Thumbi SM, Bronsvoort M, Kiara H, Toye PG, Poole J, Ndila M, et al. Mortality in East African shorthorn zebu cattle under one year: predictors of infectious- disease mortality. BMC Veterinary Research. 2013a; 9(1):1-4.
6. Stein A, Irvine RJ, Ropstand E, Halvorsen O, Langvatan R, Albon SD. The impact of gastrointestinal Nematodes on Wild Reindeer. Experimental journal of Animal Ecology. 2002;71(6):937-945.
7. Dhar DN, Sharma RL, Bansal GC. Gastrointestinal nematodes in sheep in Kashmir. Veterinary Parasitology. 1982;11: 271-272.
8. Ezenwa VO, Jolles AE. From host immunity to pathogen invasion: the effects of helminth coinfection on the dynamics of microparasites. Integrative and Comparative Biology. 2011; 51(4):540–551.
9. Soulsby EJL. Helminth, Arthropods and Protozoa of domesticated animals (Text book) Williams and Wilkins Company, Baltimore 7th Edn., Tindal and Cassel LTD. 7-8 Henrietta Street London WO2. 1989;212-242.
10. Tariq KA, Chishti MZ, Ahmad F, Shawl AS. Gastro- intestinal nematode infections in goats relative to season, host, sex and age from the Kashmir valley, India. Journal of Helminthology. 2010;84:93–97.
11. Al-Quaisy HHK, A-Zubaidy AJ, Altaif KL, Makkawi TA. The pathogenecity of haemonchosis in sheep and goats in Iraq, Clinical Parasitology and Haematological findings. Veterinary Parasitology. 1987;24(4): 221-228.
12. Leiper JWG. Report to the government of Iraq on animal parasites and their control. Experimental Technical Programme FAO Rome. 1957;610.
13. Gupta A, Dixit AK, Dixit P, Maharjan C, Shrivastava AB. Incidence of gastrointestinal parasites in wild ruminants around Jabalpur, India. Journal of Threatened Taxa. 2011;3(11): 2226-2228.
14. Ezenwa VO. Habitat overlap and gastrointestinal parasitism in sympatric African Bovids. Parasitology, 2003;126(4): 379-388.
15. Nunn CL, Altizer S. Parasites and primate conservation. Infectious Diseases in Primates. Charles Nunn and Sonia Altizer, eds. 2006;213-247
16. Skykes AR, Mc Farlene RG, Famillton AS. Parasites, Immunity and antihelminthic resistanc. Progress in Sheep and Goat Research CAB International. 1992;8:179-191.
17. Jithendran KP, Bhat TK. Epidemiology of parasites in dairy animals in the north-west humid between body weight of sheep and parasites showed Himalayan region of India with particular reference to the gastro-intestinal nematodes. Tropical Animal Health and Production. 1999;31(4):205-214.
18. Vander Waal K, Atwill ER, Isbell LA, Mc Cowan B. Mixed-host aggregations and helminth parasite sharing in an East African wildlife–livestock system. Veterinary Parasitology. 2014;205(1-2):224-232.
Available:http://dx.doi.org/10.1016/j.vetpar.20 14.07.015
19. Pandit BA, Shahardar RA, Bhat AS, Darzi MM. Prevalence of gastrointestinal parasitic infection in sheep of Kashmir Valley under different management practices. Applied Biological Research. 2003a;5(11):1-5.
20. Yadav A, Khajuria JK, Raina AK. Seasonal prevalence of gastrointestinal parasites in sheep and goats of Jammu. Journal Veterinary Parasitology. 2006;20(1): 65-68.
21. Khajuria JK, Katoch R, Yadav A, Godara R, Gupta SK, Singh A. Seasonal prevalence of gastrointestinal helminths in sheep and goats of middle-agroclimatic zone of Jammu province. Journal of Parasitological Diseases. 2013; 37(1):21-25.
22. Rajapakse RP, Faizal VJ, Horadagoda ACM, Dharmawrdan NU, Paranagama WD. An abattoir study on the prevalence of gastrointestinal nematodes of goats in the dry zone of Sri Lanka. Journal of National Science Foundation. 2008;28(4):265-275.
23. Radostits OM, Gay CC, Hinchcliff KW, Constable PD. A textbook of the diseases of cattle, horses, sheep, pigs and goats. Veterinary Medicine. 2007;10:2045-2050.
24. Adeniyi IC, Morenikeji OA, Emikpe BO. The prevalence of gastro-intestinal parasites of carnivores in university zoological gardens in South West Nigeria. Journal of Veterinary Medcine and Animal Health. 2015;7(4):135-139.
25. Shibashi T, Shimamura A, Izumo A, Nogami S. Asurvey of parasites in the feces of Sika

deer, Cervus nippon, from Kanagawa, Saitama and Chiba prefectures, Japan. Japanese Journal of Zoo and Wildlife Medicine. 2003;8(2):95-99.

26. Lim YAL, Ngui R, Shukri J, Rohela M, Naim HRM. Intestinal parasites in various animals at a zoo in Malaysia. Veterinary Parasitology. 2008;157(1-2):154-159.
27. Fagiolini M, Riccardo PL, Piero L, Paolo C, Riccardo M, Stefania P. Gastrointestinal parasites in mammals of two Italian zoological gardens. Journal of Zoo and Wildlife Medicine. 2010;41(4):662-670.
28. Opara MN, Osuji CT, Opara JA. Gastrointestinal parasitism in captive animals at the zoological garden, Nekede Owerri, Southeast Nigeria. Ostrich. 2010;2(5):21-28.
29. Thawait VK, Maiti SK, Dixit AA. Prevalence of gastro-intestinal parasites in captive wild animals of Nandan Van Zoo, Raipur, Chhattisgarh. Veterinary World. 2014;7(7): 448-445.
30. Cote IM, Poulin R. Parasitism and group size in social animals: A meta-analysis. Behavioral Ecolology. 1995;69(2):159–165.