

Cyclical Preponderance of Gastrointestinal Parasites and their impact on Small ruminants around Gwalior (Madhya Pradesh) India

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Submitted: 07 Jan 2022; Accepted: 12 Jan 2022; Published: 19 Jan 2022

Citation: : Ovais Ali Wani. (2022). Cyclical Preponderance of Gastrointestinal Parasites and their impact on Small ruminants around Gwalior (Madhya Pradesh) India. *Adv Hema Onco Res*, 5(1): 79-83.

Abstract

In India, the Livestock sector plays an important role in the economy and is one of the most potential sub-sectors of agriculture which plays a necessary role in promoting human health and most particularly in central India, Small ruminants like (sheep and goat) constitute the major portion of livestock. Gwalior is considered as a Semi-Central Zone where different tribes particularly Gujjar's and Bakerwals had made cattle rearing as their professional business. The production and productivity of small ruminants in Gwalior state are greatly hindered by various diseases including gastro-intestinal parasitic infection which is caused due to improper care, unhygienic environmental conditions, harsh and hot climatic setup, and close contact with other infected animals. Gastrointestinal parasitism is a global problem. Therefore, a one-year-long epizootic survey was conducted to study the prevalence of gastrointestinal parasites and their various species present in small ruminants (goats/sheep) in the Gwalior region. From January 2019 to January 2020, a total of 338 faecal samples from goats of different locations in Gwalior (MP) India were examined to confirm the presence of parasites and gastrointestinal parasitic infections. Majority of the samples were found positive for endoparasites and goats were also detected positive for gastrointestinal parasites. In Goat, the overall incidence of *Haemonchus*, *Coccidia*, *Trichuris*, *Nematodirus*, and *Fasciola* were 47.6%, 36.5%, 39.6% respectively. The occurrence of *Nematodirus* and *Fasciola* (20.9%, 2.32%) has been observed in sheep only.

Keywords: Prevalence, Sheep, Goats, Endoparasites, Microscopic Analysis, Infection, Gwalior

Introduction

Parasitic gastroenteritis, constitutes to pose a serious health threat and a drawback to the productivity of small ruminants like goat and sheep due to the associated morbidity, mortality, cost of treatment and control measures. As, cattle rearing is one of the most potential subsectors of agriculture which plays a key role in assisting human health and economy of the India. Livestock not only aid to upgrade the financial condition but also makes a substantial benefaction to mankind. However, livestock is a fundamental part of agricultural system specially in Gwalior region which has eventually a better contribution to enhancing the economy of India. Small ruminants (sheep and goat) constitute the major part of livestock. The total contribution of livestock subsector to Gross Domestic Product (GDP) in India is approximately 4.23%. In Gwalior, 80% rural people are involved with livestock farming. Most animals are nurtured in small houses under the traditional husbandry performs where small ruminant especially goat and sheep are mainly reared for various reasons including milk, meat,

wool and skin production. The losses caused due to the parasitic infections are in the form of slight health conditions, retarded growth rate, decline in the working proficiency. Decrease in milk and meat production cost associated with preventive measures and reduces the disease defiance capability, which may eventually lead to higher mortality rate. GI parasitic infections especially Fascioliasis, Haemonchosis, Trichostrongylosis, Oesophagostomiasis, and Moniezia lessened the growth and productivity of goats. It has been observed that 30% adult goats die due to the gastrointestinal parasitic contaminations under both rural and farm condition (4) The commonness of gastrointestinal helminths is related to the agro-climatic conditions like quantity and quality of pasture, temperature, humidity and grazing behaviour of the host [1-3].

Haemonchus contortus, found in the abomasum of sheep and goats, causes blood wastage. It has been recorded that each worm sucks about 0.05 to 0.08 ml of blood per day or responsible for continuous outflow of blood from feeding site resulting severe

anaemia. A decrease in profitability up to 15% and weight loss up to 50% due to gastrointestinal parasites have also been reported. Infections caused due to GI Parasites also affect milk production in cattle, which is reduced by about 3kg per day. Natural changes in season, prevalence and relative burden are the key factors to control the parasitic diseases efficiently. However, in most areas of India especially in the marginalised areas of Gwalior like Pahadia, Kampoo. No study has been conducted regarding the prevalence/preponderance of different gastrointestinal parasites in small ruminants. Numerous epidemiological studies have been directed on gastrointestinal parasites of small ruminants in different regions of the country but, a restricted investigation was done on gastrointestinal parasites of goat and sheep in Gwalior India. Moreover, the current study comprises two veterinary hospitals two different areas of Gwalior namely 'Vyas animal care & cure (VACC) pet hospital' and 'Pashu Chikitsalay animal hospital'. They were selected due to their earthly location as well as excessive patient load.

Methods and Materials

A total of 338 faecal samples were scrutinized for the research work; 86 of these were from sheep and 252 from goats. The faecal samples were collected from various farms and small stock holders in Gwalior. The faecal samples were carried to the Endocrinology Lab, School of studies in Zoology; Jiwaji University Gwalior India for the identification of endoparasitic infection using direct microscopic examination, centrifugation floatation and basic sedimentation techniques. Identification of the eggs or cysts was made on the basis of morphological characteristics and Volume of eggs. The whole data was critically and statistically analysed by using the Pearson Chi-Square test.

Statistical Survey

Questionnaire figures were entered into the excel spreadsheet. The descriptive examination was performed by employing the frequency (N, %) of positive and negative sample test outcomes overall and stratified by various illustrative variables. Invariable analysis was conducted by using the Chi-square test and t-test for the selected explanatory variables and those having a P-value ≤ 0.05 were considered noteworthy. Data management and analysis were performed by using MS Excel, STATA, and SPSS version 12.

Materials Used During Analysis:

Distilled water, applicator stick, universal bottle, polythene bags, labelling sheets, glass slides, hand gloves, masking tape, saturated salt solution, beaker, universal bottles, spatula sieve, light microscope, faecal samples, freezer, xylene.

Questionnaire Survey:

During sample collection, the facts concerning with the animal husbandry practices such as feeding schedule, farm management, veterinary care, and anthelmintic treatment were asked to the farm owners.

Faecal Examination

Faecal floatation and sedimentation procedures were carried out

during the investigation [4-5]. For faecal floatation, 10g of the faecal sample was mixed with 50ml of distilled water in a beaker and sieved through a sieve into another beaker. The solute in the second beaker was put in a 20ml centrifuge tube and then centrifuged at 1500rpm for about 15 minutes. Then, the supernatant fluid was completely cast-off. In the next step, the saturated sugar solution was mixed into the tube and centrifuged again at 1500 rpm for 15 minutes. After that, the tube was filled with a sugar solution; a coverslip was placed on the tube and placed on a glass slide for microscopic examination after 30 minutes of waiting. For the sedimentation method, 5g of faeces was intermixed with 200ml of water in a beaker and poured the mixture into a fresh beaker through a sieve. After 10 minutes, 75% of the supernatant fluid in the beaker was discarded and refilled the beaker with pure water. This step was repeated 4-5 times until the supernatant fluid was crystal clear. 95% of the supernatant fluid was discarded. Lastly, one drop of the sediment was placed on the glass slide, and a coverslip was placed on the glass slide and examined under a high-resolution microscope.

Results and Discussion:

The overall prevalence of endoparasites in both sheep and goats was found to be 68.9%. However, the prevalence of endoparasites tended to be higher ($p=0.06$) in sheep (72%) as compared to goats (63.69%). The regularity of occurrence of different species identified in sheep and goats are shown in Table 1 and Table 2 respectively. A significant difference ($p < 0.001$) was noted regarding the prevalence of various species of parasites in sheep. Similar outcomes were also observed for goats. The prevalence of *Haemonchus* was higher ($p = 0.05$) in sheep compared as to goats. Similarly, *Trichuris* were more frequently ($p < 0.01$) found in the faecal samples of sheep as compared to goats. However, the prevalence of *Coccidia* was alike ($p > 0.05$) in both types of animals. On the other hand, *Nematodirus* and *Fasciola* were only spotted in the faecal samples of sheep alone and were absent in the goats mentioned in the Table 1. Various species of endoparasites recovered in the present study has also been reported earlier [6-7]. The higher prevalence of haemonchosis in sheep than goats may be attributed to a variety of factors like ground grazing habit of sheep, relatively less cleanliness and extensive pasture grazing compared with goats. *Haemonchus* is a vital and joint nematode parasite and needs a special attention for its control. It has been suggested that *Haemonchus* can attain resistance quicker than other gastrointestinal nematodes, like *Trichostrongylus*, because of its high biotic potential [8]. The outcomes of the current study show that *Haemonchus*, *Trichuris* and *Nematodirus*, *Coccidia* are completely prevalent in the Gwalior region and its nearby areas. It has also been reported that *Coccidia* and other gastrointestinal nematodes as mixed or single infections are the major parasitic diseases of sheep and goats in tropical and temperate climates [9]. Oocysts of the endoparasites of sheep and goat are mentioned in the Figure 1 and Figure 2 respectively. Meanwhile, Deaths due to *Eimeria* species may also occur though lowered productivity due to poor growth is usually unnoticed by farmers.

Table 1: Species-wise Prevalence of Gastrointestinal Endoparasites in Sheep

Name of Parasites	No. of samples positive	Relative Prevalence* (%)	Overall prevalence (%)
<i>Haemonchus</i>	50	80.7	58.1
<i>Coccidia</i>	30	51.6	37.2
<i>Trichuris</i>	20	32.3	23.2
<i>Fasciola</i>	02	4.4	2.32
<i>Nematodirus</i>	18	29.0	20.9

Prevalence of gastrointestinal parasites in Sheep. Sheep (N = 86)

Table 2: Species-wise Prevalence of Gastrointestinal Endoparasites in Goat

Name of Parasites	No. of samples positive	Relative Prevalence* (%)	Overall prevalence (%)
<i>Haemonchus</i>	120	75.5	47.6
<i>Coccidia</i>	92	57.5	36.5
<i>Trichuris</i>	100	62.5	39.6
<i>Fasciola</i>	ND	ND	ND
<i>Nematodirus</i>	ND	ND	ND

Prevalence of gastrointestinal parasites in Goat. Goat (N = 252) and ND= No Detection

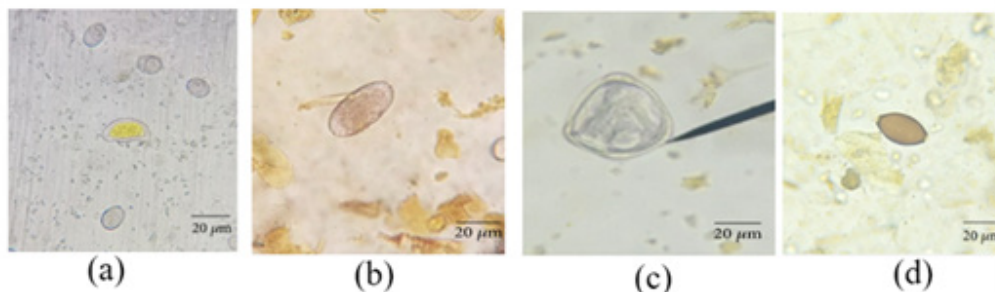


Figure 1: Parasite oocyst/eggs of Sheep: (a) *Eimeria* spp. ($\times 400$), (b) *Trichostrongyles* ($\times 100$), (c) *Moniezia expansa* ($\times 400$), and (d) *Trichuris* spp. ($\times 400$).

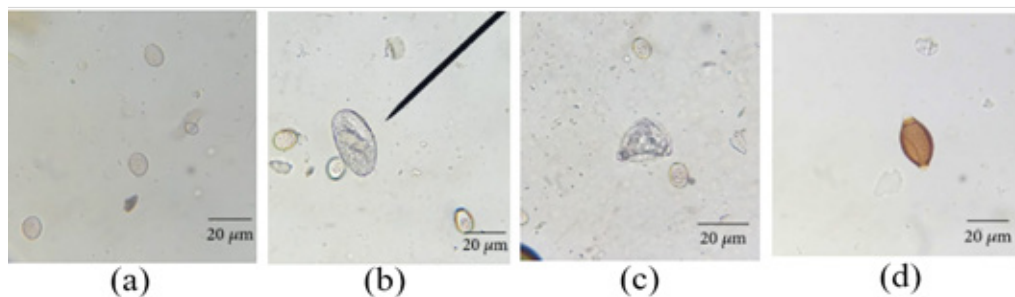


Figure 2: Parasite oocyst/eggs of goat: (a) *Eimeria* spp. ($\times 400$), (b) *Trichostrongyle* spp. ($\times 400$), (c) *Moniezia expansa* ($\times 100$), and (d) *Trichuris* spp. ($\times 400$)

Inclusive Prevalence of Gastrointestinal Parasitic Infections:

The general preponderance of gastrointestinal parasitic infections in small ruminants like sheep and goat showed uniformity with the observation of Hassan and Gadahi who recorded 61.4% in small ruminants in Ethiopia, 63.41% in Black Bengal goat in Chittagong district, Bangladesh and 63.50% in small ruminants in and around Rawalpindi and Islamabad, Pakistan respectively [10]. The previ-

ous observation was partially consistent with the reports of Khajuria et al (2012) Dagnachew et al, Bui et al (2009) and Asif et al (2008), who reported 67.24 % in Jammu province, 47.67% in Ethiopia, 58.0% in the University of Maiduguri research farm in Nigeria and 65.7% in Pakistan, respectively [11]. Poorer prevalence of gastrointestinal parasitic infections was noticed by Rehman et al (2006), Muraleedharan (2005) who recorded 41.16% in Pakistan and 46.12% in India respectively. On the other hand, observation

of this study was greatly varied from Islam et al (2008) and Lima et al (2003) who recorded 74.55% in different regions of Bangladesh and 82% in Brazil respectively [12]. change in the occurrence of gastrointestinal parasites infection might be due to geo-climatic conditions, sample size, breed, age, mode of nutrition, behaviour, availability of host, foliage, grazing pattern, nurturing and husbandry measures, deworming, gene resistance etc.

Season Related Prevalence of GI Parasites in Small Ruminants:

The cyclical effect on gastrointestinal parasitism in small ruminants was found significant ($p < 0.05$) throughout the year. In all seasons (winter, summer, and rainy season), small ruminants like sheep and goat were infested with the GI parasites. Seasonal prevalence and concentration were highest in the rainy (72.4%) followed by the summer (61.8%) and winter season (56.7%) as mentioned in Figure 3 and Figure 4 respectively. The present outcome is similar to the previous reports of Yadav et al (2006) who reported that the higher prevalence was in the rainy season (88.5%), but contradictory to the report of Biswas et al. (2014) who reported that the higher prevalence was in summer (84.6%), surveyed by rainy season (83.6%) and in the winter season (81.2%) in Bhola district, Bangladesh.(2002) The present result varied with the reports of Azhar et al who described a higher prevalence in spring (20.0%) followed by winter (13.0%), while the lower (9.0%) was recorded during summer in Pakistan [11,13]. This might be due to the fact of change in the geographical area of the study zones, the season of survey, and also the procedures of the study [14].

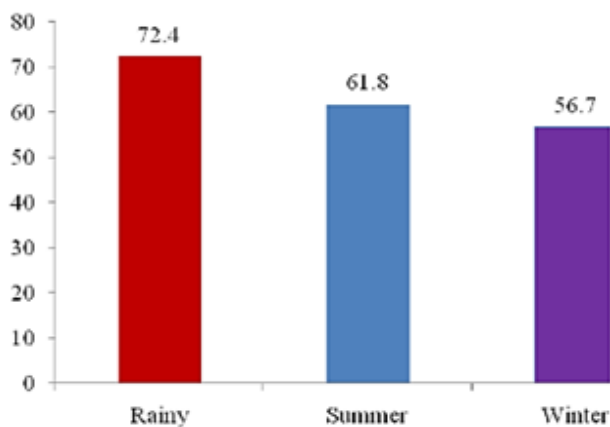


Figure 3: Seasonal Prevalence of Gastrointestinal Parasites in Sheep and Goat

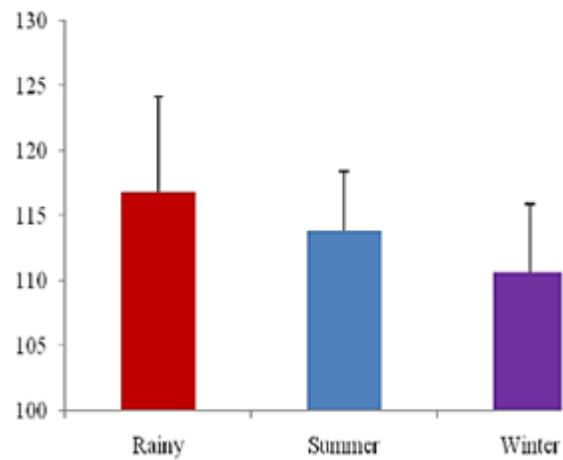


Figure 4: Seasonal Occurrence of Faecal (EPG) Gastrointestinal Parasites in Sheep and Goat

Conclusion:

Small ruminants including sheep and goats in the Gwalior region were infected by a variety of Gastrointestinal parasites, the majority of which were coinfections. An overall 68.9% infection was detected in small ruminants like sheep and goats. Although the Incidence of Gastrointestinal parasites was relatively high. As the parasite intensity was relatively high in the study area, appropriate treatment and control measures should be provided. Further, molecular studies should be performed to know the genetic differences in GI parasites between Gwalior and the rest of the other states in India. Prevalent agro-climatic conditions like excessive stocking of the animals, grazing of young and adult animals together with unwell drained land provide ideal situations for spread of the endoparasites to build up a clinical infestation of the host the overall higher incidence of nematode infestation in the areas surveyed could be accredited to the lower immunity of hosts as a result of malnourishment. As the cattle rearing in that area under investigation largely depended on grazing in worsened rangelands. It was also observed that farms in these areas lacked covering fences, sheep and goats used the same meadowland for grazing. Gastrointestinal parasitism has been found in both sheep and goats which is now becoming a serious threat in the entire state. Therefore, Regular control measures should be practiced to reduce the parasitic burdens in the affected areas.

Limitation of the Study

This study was conceded out to conclude the prevalence of GI parasites seasonally but the study doesn't disclose why some parasites were more predominant and others were not. This study is limited to definite parameters and some of the parts of the study were left untouched due to time and corona virus outbreak. Future researchers can elaborate this study by forthcoming to the untouched portion.

Recommendation

- More studies on gastrointestinal parasites in Gwalior region of Madhya Pradesh, India should be carried out.

- Preventive and control measure should be considered in the research study area to reduce the difficulty of gastrointestinal parasites by undertaking on a proper strategic dehelminthization program and good management practices.
- Awareness and enlightenment program to educate villagers as well as farmers should be instituted by the local government authority.

Author's Contributions

This research was carried out in collaboration with all authors. Ovais Ali Wani and Ovais Ahmad Dar performed the sample collection. Manu Sharma & Mubasher ul Islam carried out the laboratory work. Ovais Ali wrote the draft of the article. Then supervised the preparation of the manuscript and suggested and discussed the main points of the final draft of the article.

Acknowledgments

The authors acknowledge the farm owners from Pahadia, Kampoo which are the adjacent areas of Gwalior (MP-INDIA), who cooperated in the sample collections. Faecal flotation, Sedimentation, centrifugation, and microscopic analysis were kindly supported by the Endocrinology Laboratory, Department of Zoology, Jiwaji University, Gwalior India.

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